SOFTALK

VOLUME 4 MARCH 1984 $3.00

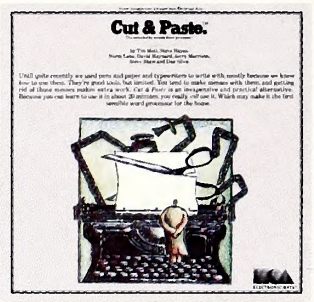
DANCING APPLES

EXEC SENSIBLE

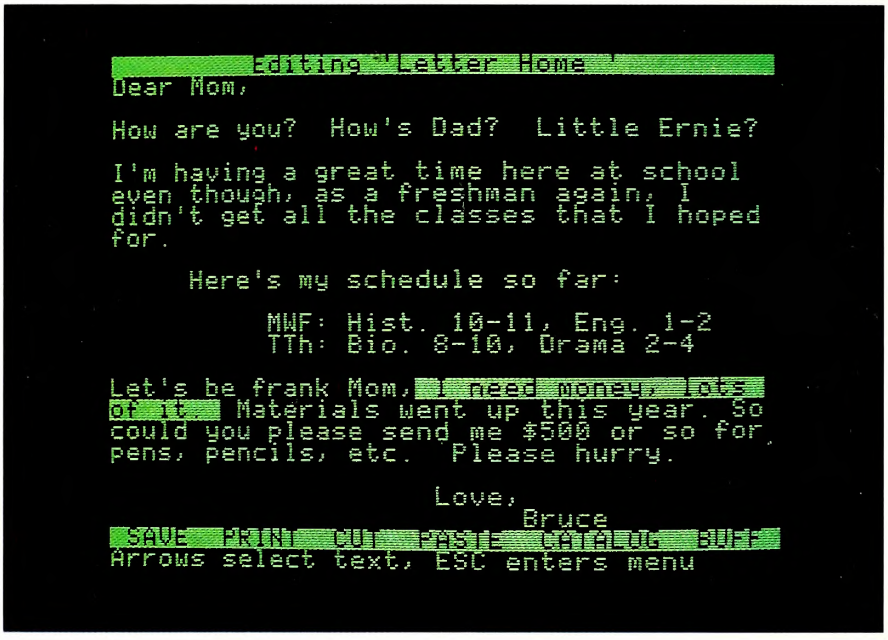
EEK! THE APPLE II MOUSE

JUST THINK:

GRAND UNIFICATION ADVANCES



If you can learn to use this word processor in 90 seconds, can it really be any good?



CUT & PASTE™ *displays its commands on a single line at the bottom of the screen. This makes working with it easier and also gives you more usable space on the screen.*

Of all word processors on the market today, Cut & Paste may well be the easiest to use. In fact, by the time you finish reading this section of the ad, you'll know how to work with Cut & Paste. So read on.

START TYPING. Working with Cut & Paste is like working with a typewriter. If you know how to use a typewriter, you already know how to type in your draft with Cut & Paste. The only real difference is, with Cut & Paste it's easier to correct typos.

MAKING CHANGES. Let's say you've decided to make a cut in your rough draft. To do this you put the cursor (the bright block) at the start of the text you want to delete, and stretch it through to the end of your cut. Then you send the cursor down to the "CUT" command on the bottom of the screen. Done.

If, on the other hand, you want to keep that line, but put it in a different part of your draft, you use the "PASTE" command. You mark the point of insert with the cursor. Then you put the cursor over "PASTE." That's all there is to it.

PRINTING IT OUT. When you like the way your work looks, you print it. Put the cursor on the "PRINT" command. Then set your margins, in inches. That's it.

You now know how to use Cut & Paste.

OKAY, IT'S SIMPLE. BUT HOW GOOD IS IT? Cut & Paste has all the features you'll ever need to use at home. Here are a few of them:

1. Scrolling dynamic menus
2. Automatic word wrap
3. Simple cut & paste editing
4. Block indenting
5. Set margins and paper size in inches
6. Tabs
7. Automatic page numbering
8. Controllable page breaks
9. Headings
10. Scrolling text windows
11. Automatic widow and orphan control
12. Clear and concise manual

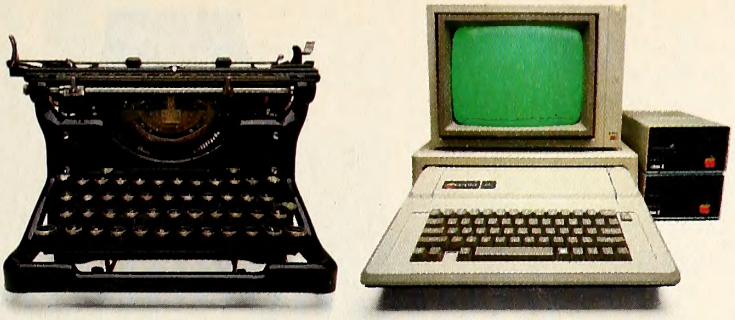
In other words, Cut & Paste will do just about everything other word processors do. But Cut & Paste will do it more easily. Without complex commands and modes.

If you think about a word processor in terms of what it replaces (typewriters, pens and paper, files), Cut & Paste begins to look very good indeed.

And when you consider that *all this power can be had for approximately* $50, we think you'll see why we believe Cut & Paste is something of an achievement.

A PHILOSOPHY OF DESIGN. The people who designed, developed and programmed Cut & Paste have some fairly heavy credentials.

They are people who worked on the internationally-famous user interface designs that led to the Xerox Star® and Apple's Lisa.® They are also



THE CHANGING OF THE GUARD. *Until quite recently we used pens and paper and typewriters to write with, mostly because we knew how to use them. They have been good tools, but limited. You tend to make messes when you work with them, and getting rid of those messes makes extra work. Cut & Paste is an inexpensive and practical alternative. Because it is as easy to use as a typewriter, you really will use it. Which may make it the first sensible word processor for the home. Thus an alleged labor-saving device has come to a position where it really can save a significant amount of labor, i.e., yours.*

THE MEN WHO MADE CUT & PASTE. *The Linotype machine pictured here was the 19th century's most important contribution to word processing technology. It let typesetters compose and rearrange text in the form of metal castings. The importance of Cut & Paste, of course, must await the judgment of history. Nevertheless, the seven men who developed it look confident here. Standing left to right, they are: Norm Lane, Steve Shaw, David Maynard, Dan Silva, Steve Hayes and Jerry Morrison. Seated at the console is Tim Mott, whose idea this was in the first place.*

people who have in common a very lucid philosophy of design.

Computers and the programs they run are tools, they believe. Tools are never noticed unless they are bad tools. When they're good, they become, in effect, invisible. And if you want to make a good tool—an invisible tool—you'd best study the way people use the tools they already have.

As a result of this thinking, Cut & Paste was designed to work much in the same way that you already work with a typewriter or with pen and paper. The most complex and powerful parts of the program are hidden from view. The work they do takes place deep in the machine. All you get to see are the results.

But beyond that, there is something almost indefinable about a good design. Things about it just seem to work crisply. Little touches and features that you notice make you want to smile. If it's really good, it *feels* good.

Cut & Paste feels good.

ELECTRONIC ARTS™

THE PRODUCTS *of Electronic Arts can be found in your favorite computer stores, software centers, and in leading department stores throughout the country. Both Cut & Paste and Financial Cookbook™ are now available at a suggested retail price of $50 for the Apple IIe and the Commodore 64 and will soon be available for the IBM-PC and Atari.*

OUR COMMITMENT TO HOME MANAGEMENT.

Cut & Paste is just one of a growing number of products we're publishing within the category of "home management software." These products are all built around the same program architecture, making them all equally "friendly," as well as remarkably straightforward and practical. We believe that designs like these will soon make home computers as functional and efficient as today's basic appliances.

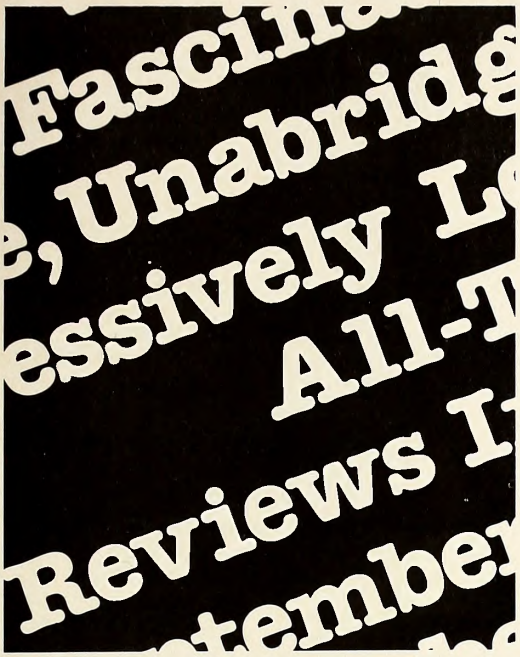
Our next product in this line is called *Financial Cookbook*. It's a realistic alternative to the complex, pre-programmed financial calculators we all wish we knew how to use. With a few, simple keystrokes, *Financial Cookbook* lets you make more than 30 key time-value-of-money computations—just about all the ones you'd ever use for personal finances—like calculating mortgages with changing interest rates, compounding the interest on IRA and savings accounts, and buy-versus-lease comparisons for automobile purchases.

To find out more about these home management products and about what we have planned for the future, call or write: Electronic Arts, 2755 Campus Drive, San Mateo, CA 94403 (415) 571-7171.

SOFTALK

MARCH 1984

DEPARTMENTS



PREVIEWS

April Season Openers . . . Most Popular Software Poll Results . . . Exec Quality . . . Apples and Prenatal Monitoring . . . Jeppson's Ill Directories . . . and more . . .

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On Our Cover: Photography has been used to record dance movements for future generations. Now Apple Computers can accomplish the complex task of Dance Notation. Danced by Cathy Vital and Don Bernstein. Photograph by Bill Fitzgerald.

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Back Issues: $2 through February 1981; $2.50 through July 1981; $3.50 through September 1982; $4.00 thereafter. November and December 1980, January, February, March, September, October, and November 1981, and December 1982 are sold out. December 1981, February and May 1982, and February and December 1983 are in short supply.

Problems? If you haven't received your *Softalk* by the fifteenth of the month, or if you have other problems with your subscription, Marsha Stewart can help out. Call (818) 980-5074 or (800) 821-6231.

Moving? Send new address and a label from a recent *Softalk* to Softalk Circulation, Box 7039, North Hollywood, CA 91605; telephone (818) 980-5074. Please allow six to eight weeks for processing.

STRAIGHTALK

I WAS JUST THINKING. . . .

What do you mean when you say, "Just think. . . .?"

"Paris in May? Just think what fun it'll be. . . ."

"Just think what it would be like if everyone had a computer. . . ."

"You can't make such an important decision so quickly. Just think a minute."

"Some of the top math students in this country would have trouble passing math in Japan. Just think what that means."

Sometimes you mean just about the same as "what if," except that it's a what-if about concepts rather than numbers. But not usually. Usually, "just think" means *consider*, *think of all the ramifications*, *go to the root of the matter*, *look for causes and possible solutions*, or *check your premises*.

In *Softalk* it means all those things: It's the name of a new feature, *Softalk*'s first step toward a bit wider scope. It's a from-time-to-time series of articles about almost anything that makes a difference in the quality of our lives, written by people who have good reason to know and just plain good *reason*—outstanding thinkers, in our industry or out.

In upcoming issues, you'll learn what Doug Carlston thinks about the state of education in the United States, how Steve Wozniak feels about piracy and computer crime, what conclusions Jock Root has derived about the common links between computer aficionados and science fiction buffs, and lots more.

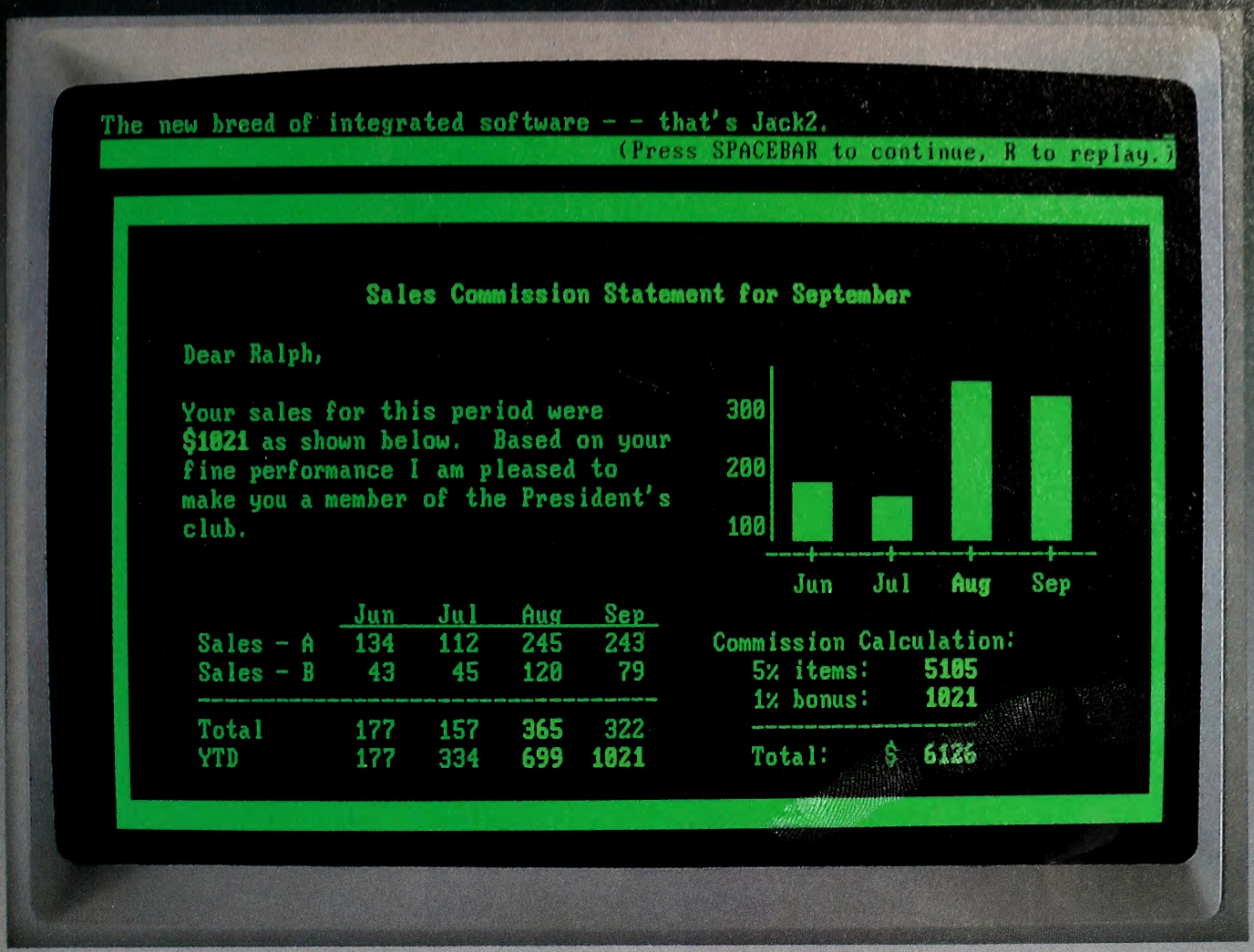
Senior editor David Hunter kicks off Just Think in this issue with the story of the most definitive work done to date in the search for proof of Albert Einstein's Grand Unification Theory. While it might not make much difference to most of us whether everything is one in terms of physics and mathematics, the implications of such a theory being true call into question our ideas about the very nature of man, about free will, about the values and premises by which we guide our lives.

The microcomputer world is changing, embracing more and more people with wide-ranging interests, from multifarious occupations and lifestyles. Still, especially in the Apple world, we are a mixture of pioneers and, lately, of the avant garde—settlers of new territory. We're not a tiny community anymore, and in only a few years we will be a hundredfold, or a thousandfold.

And because we were here first—every one of us who's chosen to use a microcomputer up to now and for a handful of months hence—all those folds will look to us as leaders. It's a magnificent opportunity to affect the quality of life for the better; but we must know where we lead. We must look outward, and deep within as well.

That's why *Softalk* is broadening it's scope; and that's what Just Think is all about.

We hope you enjoy it and that you will just think with us. MCT



JACK2. THE BEST PC INTEGRATED SOFTWARE YOU CAN FIND. NOW YOURS ON THE APPLE IIe.

With JACK2, you can do word processing, spreadsheets, data base management, charting. All at the same time. On the same screen. Without changing diskettes or exiting programs.

And, you can print out what's on your screen – text, calculations, and graphs – on the same page. What you see is what you get!

No need for windows. Additional monitors or hardware of any kind. No need to close one file before you open another. JACK2 is as easy to master as it is powerful to use.

Picture a screen that graphically displays your disks and names them. With envelope icons that can be scrolled up or down from 1 to 50 showing you all your files. JACK2 will even show you the forms inside your envelopes. And then let you choose the one you're looking for simply by pointing to it. All commands are in English. All are displayed on a single line and all have the same function throughout JACK2.

So, if you've been searching for a new breed of integrated software, you've found it. From word processing, to spreadsheets, to data base management and charting only JACK2 will let you do everything you've always wanted to do. On the same screen. At the same time.

Jack2

JACK2 is available for the Apple IIe with extended memory, 80-column card (total of 128k) and two Apple disk drives.

Business Solutions, Inc.
60 East Main Street, Kings Park, NY 11754 • (516) 269-1120

CONTEST: CREATE A SOFTWARE PACKAGE

A lot of random number generator–hating people have been waiting to see the following sentence:

This contest will have no ties.

Yep. There won't be any ties, because unlike a lot of contests recently, this one has no definite answer. Instead, entries to this month's contest will be examined by a panel of somewhat distinguished judges (none of them has ever been caught watching *We Got It Made*), and they will decide who wins the prize.

The contest is simple. Think up a fictional product for the Apple, and design the package. Despite what it says at the top of this page, it can be any kind of product—software (games, business, communications, education, utility), hardware, a book, or . . . whatever.

It doesn't matter if you're five years old or ninety-five years old. Everyone has a chance to win.

You want rules? Okay, here are some:

1. Most important: The winner of the contest will receive $200 worth of Apple-related products made by *Softalk* advertisers.

2. Include with your entry a brief description of what the product is, what it does, and how it works. This part won't be judged, but it will help in judging the package design and how it relates to the product.

3. This is not just an art contest. That is, we're looking for more than just a picture to go on a package. We're looking for an actual package design—what it would look like sitting on the store shelf. That means that in addition to the artwork, you should include the product name, publisher or manufacturer, creator, and so on. Take a look at some of the software or hardware packages you have around the computer (or go to the store and look at theirs). That's what it should look like when you're finished—words and stuff.

Please don't send in just art. Entries with only art will be disqualified and fed to the trash bin.

Please don't send complete packages (boxes, binders, zip-lock bags).

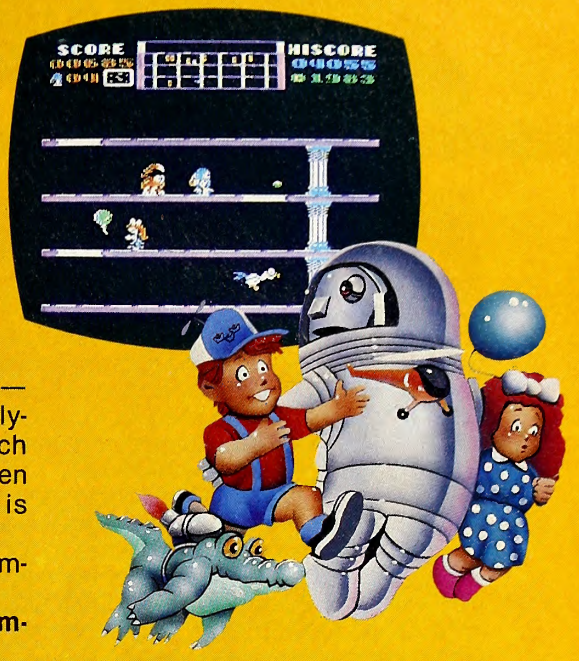
Please *do* send what the front of the package should look like. It can be on paper or cardboard, or it can be a photograph of the package.

4. To create your package, use anything that can be found on the face of the earth. Crayons, pens, paints, pastels, grease paint, construction paper, cut-outs, stencils, Letraset (rub-off letters), printing press, anything.

5. Photography is legal. It's not like the old days anymore. BudgeCo, Scarborough Systems, and Electronic Arts did some pretty nice stuff; if you think you have what it takes, then go for it. Remember, don't send in just the photograph. You can choose to send in the original with all the letterings and miscellaneous junk on it, or you can send in a photograph of the original photograph with all the letterings and miscellaneous junk on it, keeping the original for

Betcha Can't Play Just One!

Drol™



You will soon come to expect the unexpected in the hilarious and challenging underground dream world of Drol. A little red-headed girl and her propeller-beanied brother have been lured by a witch doctor's curse into the multi-leveled ruins of a lost civilization. It's your task — as a hero equipped with a rocket backpack and full-screen radar scope — to dodge hopping scorpions, monsters and snakes, flying turkeys, swords, daggers, arrows, magnets, witch doctors, and vacuum cleaners(!) in your attempts to rescue the children and reunite them with their mother. Each new level of game play is full of surprises.

Drol's wry sense of humor and amazingly detailed cartoon imagery, make this game a charmer!

For the Apple II/II+/IIe, Atari, and Commodore 64 home computers in disk format.

Gumball™

Hours of fun await you at the Sticky Sole Gumball Factory — where you'll be working against the clock to sort a tasty collection of colorful gumballs.

Your job may seem sweet at first, but after you've discovered the explosive-laced gumballs (placed by over-zealous dental assistants) or met your irritating supervisor (who is eager to undo your best efforts), you may feel that you have bitten off more than you can chew.

If, against all odds, you meet your day's quota, you'll be promptly rewarded with a promotion (to a more challenging position) and an amusing cartoon showing your higher standard of living.

Gumball — a new fast action game filled with colorful and delicious surprises.

For the Apple II/II+/IIe.

Irresistible Fun From Brøderbund!

Ask your Brøderbund dealer for Sneak Previews.

Brøderbund Software™

Discover the Difference

IF YOU'RE LIKE MOST BUY A SINGLE

YOU'LL BUY LOTS OF SPINNAKER GAMES.

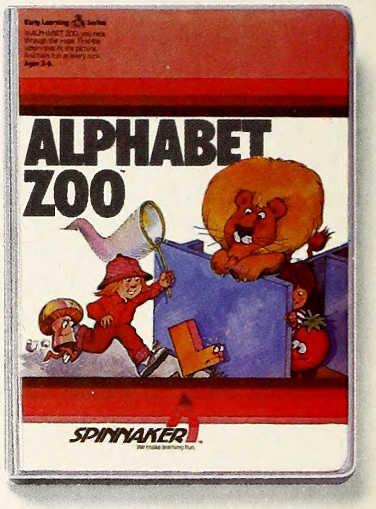
And not just because they're educational, but also because they happen to be a lot of fun to play.

In fact, they're so much fun, parents have been known to sneak in a few hours of play when the kids are asleep.

After all, if your kids are actually enjoying a learning game, there must be something to it. And there is: Fun, excitement and real educational value. That's what sets Spinnaker games apart from all the rest. And what brings parents back for more.

We offer a wide range of learning games for a wide range of age groups: 3 to 14. One look at these two pages will show you how we carefully designed our line of learning games to grow right along with your child.

So if you're looking for a line of learning games that are as much fun to play as they are to buy, consider Spinnaker Games. They're compatible with **Apple, Atari, IBM PC, PCjr, Commodore 64, Coleco Adam** and parents who don't mind their kids having fun while they learn.



A trip through ALPHABET ZOO.™ Ages 3 to 8.

It's a race. It's a chase. It's Alphabet Zoo, a game that sends your kids zipping through the maze, after letters that fit the picture on the screen.

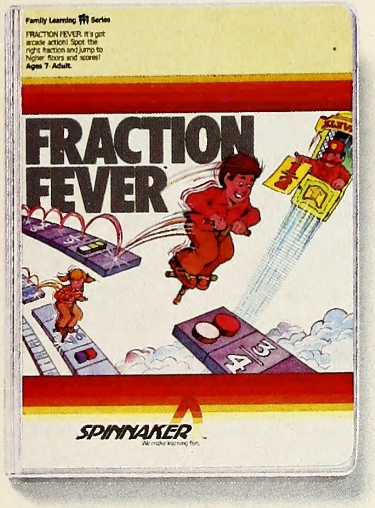
Your kids will have fun learning the relationship of letters and sounds, and sharpening their spelling skills. They'll be laughing at every turn.

It's new! KIDWRITER™ lets kids make their own storybook. Ages 6 to 10.

KIDWRITER gives children a unique new format for creating their own stories. With KIDWRITER, kids make colorful scenes, then add their own story lines. It's as versatile and exciting as your child's imagination!

Best of all, while it encourages children to create word and picture stories, it also introduces them to the fundamentals of word processing. KIDWRITER will bring out the storyteller in your children—and in you!

PARENTS, YOU WON'T SPINNAKER GAME.



FRACTION FEVER™ brings fractions into play.
Ages 7 to Adult.

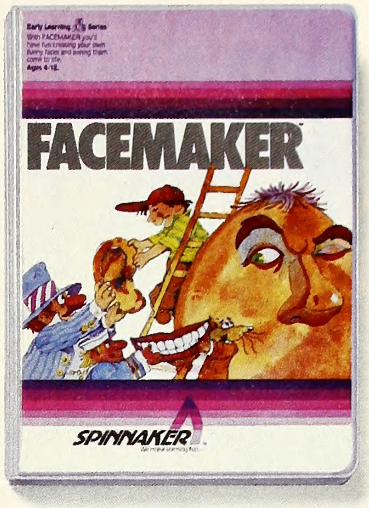
FRACTION FEVER is a fast-paced arcade game that challenges a child's understanding of fractions. As kids race across the screen in search of the assigned fraction, they're actually learning what a fraction is and about relationships between fractions.

All in all, FRACTION FEVER encourages kids to learn as much as they can about fractions—just for the fun of it!

DELTA DRAWING.™ Have fun creating pictures and computer programs.
Ages 4 to Adult.

Kids love to draw. And DELTA DRAWING Learning Program lets them enjoy creative drawing and coloring while they learn computer programming concepts.

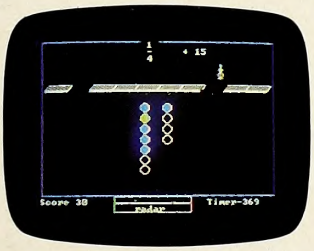
With DELTA DRAWING, even kids who have never used a computer before can learn to write programs and build an understanding of procedural thinking. It's easy, clear, and lots of fun!

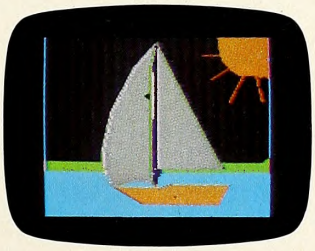


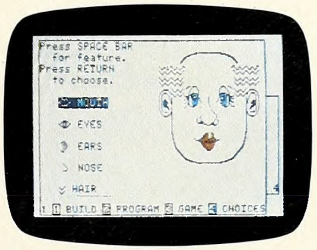
FACEMAKER™ makes faces fun.
Ages 3 to 8.

FACEMAKER lets children create their own funny faces on the screen, then make them do all kinds of neat things: wink, smile, wiggle their ears, and more.

Plus, FACEMAKER helps familiarize children with such computer fundamentals as menus, cursors, simple programs, and graphics. FACEMAKER won't make parents frown because their children will have fun making friends with the computer.







SPINNAKER™
We make learning fun.

Disks for: Apple, Atari, IBM PC and PCjr, Commodore 64.
Cartridges for: Atari, IBM PCjr, Commodore 64, Coleco Adam.

yourself.

6. Be creative! Look at the way Infocom did *Deadline*. And *Suspended*. And the rest of their stuff. Not bad, huh?

7. If you feel like it, go beyond software and try designing a hardware package. This is kind of tough. What's the most incredible piece of hardware you can imagine? What would it do? How would you package a peripheral that could turn your Apple into a full-size functional satellite? Think about it.

8. All entries become property of the Softalk Museum and will be on display after judging is over. Entries will not be returned unless contestants request them to be and only if they include a stamped, self-addressed mailer.

9. On the back of your entry, be sure to include your name, address, phone number, and a list of things you'd like to get with the $200 prize.

10. Read and follow rule number nine.

11. Entries must be postmarked by April 14, 1984. No exceptions.

That's it. Get a smock on, get the art supplies ready, and above all else, have a real good time. Send your entry, postmarked no later than April 14, 1984, to Softalk Pack, Box 7039, North Hollywood, CA 91605.

CONTEST WINNERS

ORACLE '84 DRIVEL

Nobody won. There wasn't a contest.

Normally, we would be announcing the winner of the first part of Oracle '84 at this time. Unfortunately, that part had to be cancelled due to *Time* magazine's refusal to delay the announcement of its Man of the Year (despite the contest staff's begging, pleading, and general whining).

As we explained last month, *Time* named Ronald Reagan and Yuri Andropov as co-Men of the Year a few days before Oracle contest entries were due. The sods. To get even with *Time*, the contest staff is planning to announce the winner of this month's contest a few days before *Time*'s contest entries are due. An eye for an eye.

Even though 95 percent of all contestants waited for *Time*'s announcement before sending in their entries, only a handful claimed that their Ron/Yuri predictions were genuine. We'll not mention names this time, but remarks on entries included, "I think Reagan and Andropov both had equal impacts on the world this year. Unlikely as it seems, I predict *Time* will name both of them as Man of the Year," and, "This isn't fair. I really predicted Reagan and Andropov, even though I heard the announcement on the radio today."

But the unofficial winning entry for deception came on an entry that was postmarked five days late, yet claimed, "I'm entering this contest before *Time* comes out so you know I didn't cheat. Ronald Reagan deserves it, but I think *Time* will give it to both Reagan and Yuri Andropov." Who's got a guilt complex?

So Far, So-So. Here's a progress report on Oracle '84. Remember, sports fans, an Apple Macintosh is at stake here, and this contest will decide who will be playing with mouses, windows, and super-duper hi-res graphics about this time next year.

Time's Man of the Year. Ha!

Winter Olympics. Well, they're over. See this space next month for the winners.

Academy Awards. In April, millions of people around the world will tune in to see who will win what in the film industry, only to fall asleep halfway through the show. But thousands of Oracle contestants will watch with anticipation to see if their predictions come true.

So far, the consensus seems to be *Terms of Endearment* for Best Picture, Shirley MacLaine for Best Actress, and Jack Nicholson for Best Actor. Second place looks like *Yentl*, Meryl Streep, and a tie between Robert Duvall and Al Pacino. "Sorry" to anyone whose predictions include *Indiana Jones and the Temple of Doom*, *Tootsie*, Dustin Hoffman, Jennifer Beals, Clint Eastwood, or Mr. T (you know who you are).

Sydney/Juneau. Our correspondents in Juneau have filed the following weather report: "It's kinda cold up here a lot, but sometimes it gets warm. April is a weird month, so you never can tell." Thanks, gang.

The contest staff's Australia office couldn't be reached, but they did leave a message on the answering machine: "Hi. We can't come to the phone right now, but it doesn't matter. Must be some mistake; you guys don't have an Australia office. Leave your message at the beep."

Indianapolis 500. The biggest potential tiebreaker seems to be the Unsers: Al senior, Al junior, and Bobby. Most contestants wrote "Unser," not bothering to specify which of the three speed demons they meant. If one or more of them do finish in the top three, those who specified first names will receive the nod.

A handful of contestants apparently thought it was possible to win the Indy 500 without finishing in the top three. You know who you are—the ones who named three top finishers and then a fourth person to win the race. No wonder IBM people make fun of Apple users.

MIT graduates. Didn't anybody bother to check what the undergraduate enrollment is at MIT? No, it's not possible for more seniors to graduate than there are students in the entire school. Sure, it would have taken a little extra work to find out how many people attend MIT, and those who went the extra mile will benefit.

Wimbledon. Popular choices for number-one seeds are John McEnroe and Martina Navratilova; the same two are also predicted to win. Almost everyone thinks they'll beat Jimmy Connors and Chris Evert Lloyd respectively.

Summer Olympics baseball. Ha-ha to everyone who said that there ain't no baseball in the Olympics. Traditionally, there's not, but this year there is. It's not just an exhibition game, either; the Olympic Committee assures us that there will be finals in the sport, to be played at Dodger Stadium on Tuesday, August 7.

Apple stock. If you could predict stuff like this you wouldn't need to enter contests.

Billboard Hot 100. As expected, Michael Jackson was a big favorite to have the number-one single during the first week in October. Singles from Jackson's *Thriller* album sold like crazy, but whether he'll have something on the charts in October isn't clear. Maybe a soft-drink jingle?

Presidential election. It's Reagan. Just about the only non-Reagan predictions were made by contestants who wanted to cover all the bases.

Top Thirty's Top Five. The five most frequently predicted companies are Broderbund, Apple, Beagle Bros, Electronic Arts, and Software Publishing, with Sir-tech, Sierra On-Line, and VisiCorp not far behind. Datamost and Sirius even managed to get a few. Seems the only folks who don't forget Infocom are the million or two who plunk their money on the retailer's counter.

Keep watching the news, read these pages, and don't be surprised if someone calls you on the phone and says, "Did you ever think you would win?"

That will be somebody from Publisher's Clearinghouse Sweepstakes. We usually call our winners and say something like "Uh, is Billy there?"

Now go watch the Academy Awards. ■

MACWINNER

MacWinner! December's MacContest, part of the Storytalk piece "Fat Men Can Not Jump down Chimneys," was so easy that only one entrant got the wrong answer. Many entrants took the time to painstakingly work out the decoding procedures from Sam's two-letter message included in the story. Others looked at how many letters were in the two coded words and then guessed. The answer was "Merry Xmas." The one wrong answer submitted tried to sneak by with "Happy Xmas."

Many entrants to the MacContest astutely pointed out that we had inadvertently let slip into the decoding procedure one minor mistake. The mistake was such an obvious one that it caused nobody to get the wrong answer. A couple of last-minute entrants pointed out that there was also no deadline for the contest. In recognition of this, all entries were considered eligible until the deadline for publishing the winner.

Which all goes to show that you shouldn't let the fiction department stray into the contestmeister's turf.

The winner was Dave Carse of Hinesburg, Vermont, according to the Apple's random number generator. He'll be using his $100 prize as partial payment for a second Apple disk drive from Applied Graphic Co., Shelburne, Vermont. ■

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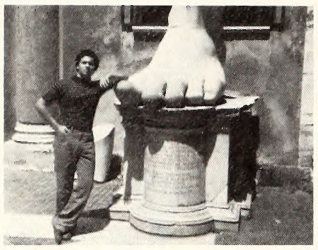

Writing adventures is not a pastime for those lacking in intestinal fortitude. In fact, it's an endeavor best undertaken by those only made of the sternest stuff. Pictured here with a research consultant is intrepid adventure author Antonio Antiochia (on the left). Antonio doesn't believe in inventing creatures for his stories, so he finds them first and interviews them at length before incorporating them into the fabric of adventure. But then Antonio has never done things the easy way: all the award-winning graphics in his first adventure, **Transylvania**, were created using a pair of paddles!

The subject of his scrutiny is Moose, formerly bill collector for Vito's Grocery and Book, currently unemployed. Moose has been kicking around for years, a footloose wanderer unwilling to discuss pedestrian pursuits of the past century. Antonio tracked Moose down in the foothills of **Transylvania** while researching the upcoming adventure **"The Crimson Crown"**. Needless to say, Moose will have a walk-on part.

Mirror Cracked -Shards Lost

London - Scrolls found under the Scattlededum castle earlier this month have been dated back to the early 1200's. Initial interpretations suggest the former presence of a "magical" mirror that gave power to its possessor. **The Coveted Mirror**, according to the scrolls, was cracked while being stolen by the then-to-be-king, Voar, and shards were scattered throughout the nearby kingdom. A piece of glass was found next to the scrolls.

You, too, can join the search for **The Coveted Mirror**, in this intriguing and colorfully animated adventure from Penguin.

The Quest™ Quest

Some time before last July, Penguin Software released an adventure entitled **"The Quest"**. Of course it had exceptional graphics and was well-written, and by early 1984 it became the best-selling adventure game on the market. The makers of **The Quest**, meanwhile, were finishing work on its sequel, **Ring Quest**, which is due shortly.

Now, however, everyone seems to be saying "me, too' and hopping onto **The Quest** bandwagon. Broderbund announced its adventure "BloodQuest" late last fall, and it comes highly recommended from the folks here at Penguin. But now Strategic Simulations has announced "Questron", Sierra On-Line has announced "King's Quest" (not to be confused with **Ring Quest**, please), and DataSoft has announced "The Dallas Quest". The oddest part of the latter is that the name of one the main authors of **The Quest** and **Ring Quest** is Dallas Snell. "The Dallas Quest" is only written by James Garon. Couldn't they have called it "The James Quest"? Of course, then all that licensing money would have gone down the tubes. Gee, we didn't even have to license our Dallas...

How can you tell Penguin's Quests from the imitators? The price. At $19.95, you can afford them.

Frivolous Shorts

Mark said to put in some frivolous shorts, so here they are.

Contest

You may have noticed, while reading the small type on some of our ads and packages, that penguin trivia keeps popping up out of nowhere. It started as a joke, when a copy writer got bored with all the "--- is a trademark of ---" stuff, and started putting little penguin quips in the little, tiny type, wondering if anyone would notice. They did, and all the Penguin copy writers started getting into the act. We've gone back and we've found 20 of these Penguinisms, and started wondering if anyone else could, too. Since a couple are obscure, our contest is that if you are the first one in your state (United States), province (Canada), or any other country to find 18 of these penguin facts, we'll outfit you in an official Penguin Software jersey and baseball cap. Send in your penguin trivia with your name, address, and jersey size to Penguinisms, Box 311, Geneva, IL 60134. We'll go by postmarks if there are two from any state. They always say "void where prohibited" with things like this, so I guess we should, too. Is it prohibited anywhere?

If you're not adventuresome, but would still like a snappy Penguin jersey and/or cap, you can actually order them for $6 each, plus $2 shipping per order. Send a check made out to Penguin Software and make sure the jersey size is listed, or we'll even take credit card orders for them on our toll-free dealer line, (800) 323-0884.

Wanted

Wanted: Honest, trustworthy Penguin lovers who'd enjoy stopping in at all your local computer stores every couple weeks and making a few bucks on the side. Send your name, address, phone #, and "why I'd like to be a penguin" to Penguins, Box 311, Geneva, IL 60134. Must be 18 or older, and staying in one area for a while.

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For a free issue of The Penguin Pages, write to Penguin Software, Dept. H, Box 311, Geneva, IL 60134 (312) 232-1984

Pages

The Virtues of Plain Speaking, Take 1.

Last March we lowered the prices of all our games to $19.95. In the past couple of months we have noticed that other publishers are beginning to do the same thing, with one significant difference: The way they tell you about it!

Instead of simply putting a reasonable price on the cover of the games they sell, they charge $30 or more and then say "Buy Two, Get One Free!" Doesn't that strike you as a rather roundabout way to offer a game for about $20?

Furthermore, such "promotions" require the customer to send in some proof of purchase in order to claim the third game.

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For product information, adventure hints, or from Illinois, Alaska, and Hawaii, please call (312) 232-1984.

Flash! Double-Res is Here!

You probably know that new Apples have a new graphics mode, called double-res, which has twice the resolution of standard hi-res, and 15 pure colors instead of the standard 6. Currently double-res is available only with an Apple //e that has the extended 64K 80-column card. Well, we've been working with it for months now, and it's beautiful! And now we're thrilled to announce that **The Graphics Magician Picture Painter** is available in a special double-res version. Author Steve Meuse has taken the original **Graphics Magician** picture editor and adapted it fully to double-res. Furthermore, the double-res version can read pictures created with the original hi-res version of **The Graphics Magician** and automatically enhance them with the double-res colors and resolution! Since **Graphics Magician**

pictures are stored according to the artists' moves (not the actual screen), these moves are easily adjusted by the computer to the double-res screen. And blended colors from our standard hi-res 108-color palette can be mapped to purer colors in our new 256-color double-res palette. The same pictures that can be displayed with the standard hi-res **Magician** can now take advantage of double-res Apples! And, instead of taking twice as much disk storage space (normal storage for double-res requires 16K of disk storage per picture) **The Graphics Magician** double-res pictures still take the same tiny amount of space as **Graphics Magician** standard hi-res pictures. Yes, we're excited!

To show you how nice double-res looks, we are also releasing a special edition of the graphic adventure **Transylvania**; one side of the disk containing the standard hi-res version, the other disk side containing the special double-res edition. **Transylvania** has already been hailed by **Softalk** as having the best graphics ever in an adventure, and been given an award from **Electronic Games** magazine for its outstanding achievements in graphics. Wait until you see what double-res does for it! Some samples are shown here on this page. The graphics are Antonio Antiochia's originals, adapted and enhanced with the double-res **Graphics Magician** by Marsha Meuse, and programmed to take advantage of the extra RAM in a double-res Apple by Steve Meuse.

Watch very soon for the special double-res edition of **The Complete Graphics System**, and other Penguin Software programs in double-res!

The Official Availability List (as predicted two months ago when this ad was written)

Applications: Graphics The Complete Graphics System - drawing and 3D designing for non-programmers AP, The Graphics Magician - animation and picture creation for programmers AP/AT, Paper Graphics - print graphics to your printer AP, Transitions - high-tech slide show AP, Additional Typesets - for Complete Graphics System AP, Map Pack - graphic map screens AP **Utilities** ShortCuts - input and sorting routines AP, DISK arRANGER - organizes your disks AP **Home Applications** coming soon **All Recreational Software is $19.95 each: Adventures** Transylvania - beautifully detailed graphics AP, The Quest - search for a dragon in a vast kingdom AP, The Coveted Mirror - animated graphics in a 2-sided disk AP **Fantasy Role-Playing** Expedition Amazon - find the lost city of Ka AP **Strategy** Pensate out-think the computer AP/AT/C64 **Arcade** Spy's Demise - quick reactions and addicting AP/AT/C64, The Spy Strikes Back - avoid being seen while searching a huge building AP/AT/C64, Minit Man - repair a bridge and get to the computer: 2 games at once AP, Crime Wave - cops and robbers chase AP, Thunderbombs - 2-way shoot-em-up AP/AT/C64 **Children's Arcade** Pie Man - rush to make pies AP/AT, Bouncing Kamungas - grow melons while avoiding kamungas AP/C64 **Educational** coming soon

AP=Apple AT=Atari C64=Commodore 64 IBM=IBM (soon)

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FASTALK

Fastalk is a quick guide to popular, specialized, new, and classic software. When you need a particular kind of program or just want to see what's new, Fastalk is the place to look for fast answers.

If a program has been reviewed in *Softalk*, it carries the issue date of the review in italics at the end of its listing, and the capsule description given reflects the published review.

A new software entry, which must be of professional quality to be included, is designated by a check mark preceding its name. A new entry loses its check mark after its first appearance and drops out of Fastalk after one to three appearances (depending on genre) if it fails to gain popularity.

A bullet preceding a title indicates a program that *Softalk* has designated as a classic, based on its ability to stand up over time, its significance for its time (breaking new ground or introducing a new genre), or its archetypal qualities.

Other entries in Fastalk are there either by virtue of current activity (the programs are selling at least as much as the least-selling entry on any of the bestseller charts) or because they are representative of the best of programs for a special interest or need (such as card games or non-Basic-specific language terminal programs).

Softalk may arbitrarily omit any package from Fastalk, whether or not it meets the foregoing criteria.

Adventure

Adventuresome story games in which players must deduce commands, make maps, and solve logical puzzles.

• **Adventure.** Crowther, Woods. The original text adventure, created on mainframe, contributed to by many over a long time. Very logical within fantasy framework, excellent puzzles, maps; complex, convoluted, and great. Several publishers: Microsoft, 10700 Northup Wy., Bellevue, WA 98004. $28.95. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $35. Frontier Computing, Box 402, 666 N. Main St., Logan, UT 84321. $10.

The Coveted Mirror. Berns, Thomason. Nicely drawn characters, arcade subgames, and fun, logical puzzles enliven nonviolent medieval adventure. Humorous and animated. Penguin, Box 311, Geneva, IL 60134. $19.95. *11/83.*

• **Cyborg.** Berlyn. Text adventure with brief action skill game hidden in plot. As a futuristic part man, part robot, you're lost in a strange forest, desperately needing food and power. At its release, in its realism and use of true plot, *Cyborg* represented one of the most significant advances in adventuring since the original *Adventure*. Sentient, Box 4929, Aspen, CO 81612. $32.95. *11/81.*

Deadline. Blank, Lebling. Episode one in a series of murder mysteries by the authors of *Zork*. Includes inspector's casebook, lab report. Text. Infocom, 55 Wheeler St., Cambridge, MA 02138. $49.95. *8/82.*

Death in the Caribbean. Hess, Hess. Challenging quest for pirate treasure features a mischievous ghost, huge maze, lush graphics. Well worth it. Micro Lab, 2699 Skokie Valley Rd., Highland Park, IL 60035. $35. *9/83.*

Enchanter. Blank, Lebling. First of trilogy sequel to *Zorks* expands interaction with other characters, goes above ground, increases use of logical magic. No big breakthroughs, but simply delightful. Infocom, 55 Wheeler St., Cambridge, MA 02138. $49.95. *9/83.*

✓ **Forbidden Quest.** Pryor, Cox. Science fiction text adventure includes five pictures that contain clues. Parser accepts multiple-word commands. Not easy. Pryority Software, 25570 Chiquito Pl., Carmel, CA 93923. $39.95.

• **Hi-Res Adventure #1: Mystery House.** Williams. Whodunit in a Victorian mansion. First adventure with pictures. Two-word parser with logical comprehension. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $24.95.

• **Hi-Res Adventure #2: The Wizard and the Princess.** Williams, Williams. The king has offered half his kingdom to the one who will bring back the kidnapped princess. Cross mountains, deserts; battle the wizard to claim your reward. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $32.95. *11/80.*

Infidel. Berlyn. Excellent puzzles and a surprising bad guy hero in well-written treasure hunt. Infocom, 55 Wheeler St., Cambridge, MA 02138. $49.95. *11/83.*

✓ **The Lion's Share.** Aaron, Murray, Rublin, Yudkowsky, Levine. Hi-res Biblical quest for beginning-to-intermediate adventurers. Collect treasures to use as bribes, answer riddles to cross the Babylonian plains. Action is predictable, parser vocabulary excellent. Davka, 845 N. Michigan Ave., #843, Chicago, IL 60611. $34.95. *2/84.*

Mask of the Sun. A unique animated graphic quest with full though sometimes frustrating parsing. Moving from room to room involves seeing scenery along the way go by—a graphics breakthrough with nice puzzles. Ultrasoft, 12503 Bell-Red Rd., #200, Bellevue, WA 98005. $39.95. *11/82.*

Masquerade. Johnson. Hard, logical, diabolically clever riddles in puzzle solver's *piece de resistance*. Great illustrations. Phoenix Software, 64 Lake Zurich Dr., Lake Zurich, IL 60047. $34.95. *11/83.*

Planetfall. Meretzky. A lovable robot steals the show in this science-fiction text adventure. Includes many outstanding puzzles, rich, colorful, intelligent text. Infocom, 55 Wheeler St., Cambridge, MA 02138. $49.95. *8/83.*

• **Prisoner 2.** Mullich, Edu-Ware. Totally relandscaped but loyal version of original game: full-color hi-res graphics added, puzzles reworded, obstacles expanded. Sophisticated and difficult exercise in intimidation with elements of satire. Escape from an island requires player to solve logical puzzles, overcome obstacles, and answer riddles. Excellent computer fare; nothing else like it. Peachtree Software, 3445 Peachtree Rd. N.E., #830, Atlanta, GA 30326. $32.95. *The Prisoner, 3/81*; *Prisoner 2, 10/82.*

The Quest. Snell, Toler, Rea. As the king's newest advisor, you must accompany a champion on a dragon-slaying mission. Champion, parser accept advice in full and multiple sentences. Penguin, Box 311, Geneva, IL 60134. $19.95. *9/83.*

• **S.A.G.A. Series.** Adams. Scott Adams's prototypical adventures—12 in all—spruced up with 100-color graphics and Votrax vocals. Fun, not always logical, very story-oriented series. Each adventure has its own theme and often exotic locale. They map small but score big on imagination. Adventure International, Box 3435, Longwood, FL 32750. $29.95 each. *7/82.*

Starcross. Science-fiction prose adventure that comes wrapped in a flying saucer. Set in the year 2186, main puzzle is to discover *raison d'etre* of miniworld asteroid. Likable, engaging. Superior puzzles. Infocom, 55 Wheeler St., Cambridge, MA 02138. $39.95. *11/82.*

Suspended. Berlyn. Well-plotted adventure demands control of six independent robots who can act simultaneously. Intelligent, challenging exercise in logic. A milestone. Infocom, 55 Wheeler St., Cambridge, MA 02138. $49.95. *4/83.*

• **Swordthrust Series.** Set of adventures, seven so far, that integrate fantasy role playing. Create one character, make friends in each new adventure, battle monsters and achieve goals together. Good stories, fun to map. Vocabulary no mystery, but puzzles are. Single character goes through all. CE Software, 801 73rd St., Des Moines, IA 50312. Number 1 prerequisite for rest. Each adventure, $29.95. *8/82.*

Transylvania. Antiochia. Some of best graphics ever in a hi-res adventure. Excellent puzzles and logic—no unfair tricks. Enjoyable. Penguin, Box 311, Geneva, IL 60134. $19.95. *6/81.*

Witness. Galley. Interactive mystery adventure set in 1938 reflects the style of pulp detective fiction popular then. Fun packaging and fun to play, although less complex than Deadline. A good step forward for an infant genre. *Infocom*, 55 Wheeler St., Cambridge, MA 02138. $49.95. *7/83.*

• **Zork I, II, III.** Blank, Lebling. Text lives! Three masterpieces of logic and grand adventure to revel in. Hard, logical puzzles with erudite parser that understands complete compound sentences and questions, has amazing vocabulary. *I* and *II* use standard scoring, standard goals; *III* has unique point system, and benevolence pays. Infocom, 55 Wheeler St., Cambridge, MA 02138. $39.95. *Zork I, 6/81*; *Zork II, 3/82*; *Zork III, 9/82.*

Business

Apple II Business Graphics. Converts numerical data into charts and graphs. Features mathematical and statistical functions. Requires 64K. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $175.

BPI General Accounting. Performs like *General Ledger*. Print checks, permits greater flexibility in handling accounts, produces 40 reports. 80-columns. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $395.

BPI System. Popular six-module business package; programs also available separately. Includes *General Ledger* (a bestseller), accounts receivable, accounts payable, payroll, inventory control, and job costing. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $395 each; job costing, $595.

dBase II. Speedy relational database management system. Requires SoftCard. Ashton-Tate, 9929 W. Jefferson Blvd., Culver City, CA 90230. $700.

General Manager. Superb user-definable database management system; can use one to four disk drives or hard disk. Change screen and field formats without reentering data, expandable to IIe and 80 columns at no extra cost. Flexible, self-contained, and powerful. Quite simply the best non-CP/M database there is. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $229.95. Hard-disk version, $374.95. *11/83.*

The Incredible Jack. Word processor, database, and spreadsheet, plus mailing label print and sort. Gives 80-column u/lc display automatically on the IIe, with 64K, 80-column card on the II Plus. Business Solutions, 60 E. Main St., Kings Park, NY 11754. $129. *8/82.*

Multiplan. Easy-to-learn electronic work sheet using plain-English commands. Powerful modeling and presentation capabilities. For use in analysis, forecasting, technical engineering, and the home.

Versions 1.04 and up use 80 columns and extended memory on the IIe. Microsoft, 10700 Northup Wy., Bellevue, WA 98004. $275.

PFS:File. Page, Roberts. User controls data in totally unstructured database. Up to 32 pages (screens) of information in each record. IIe version has 80 columns, u/lc. Software Publishing, 1901 Landings Dr., Mountain View, CA 94043. $125. *10/80.*

PFS:Graph. Chin, Hill. Works alone or interfaces with files created with *PFS:File* and *VisiCalc*. Produces bar, line, and pie charts merging data from several sources. 80 columns and increased graphics support in IIe version. Software Publishing, 1901 Landings Dr., Mountain View, CA 94043. $125. *5/82.*

PFS:Report. Page. Powerful report generator designed for use with *PFS:File*. Sorts, calculates, totals, formats, and prints presentation-quality columnar reports. Software Publishing, 1901 Landings Dr., Mountain View, CA 94043. $125. *6/81.*

Quick File IIe. Easy-to-use personal database filing system that generates reports, sorts. Fifteen fields; files as long as disk allows. IIe, two disk drives. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $100.

Risk Simulator. Estimates probability distributions related to risk situations, such as automobile maintenance expenses or employer funding of health benefits. Actuarial Microcomputer Software, 3915 Valley Ct., Winston-Salem, NC 27106. $185.

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Time is Money. Flexible personal accounting package. Checkbook balancing with a full statement on-screen. Tracks up to 240 separate assets and liabilities. Turning Point, 11A Main St., Watertown, MA 02172. $100.

VersaForm. Business-forms generator for invoicing, mailing lists, sales analysis, inventory. Hard-disk-compatible. Applied Software Technology, 14125 Capri Dr., Los Gatos, CA 95030. $389. *6/82.*

• **VisiCalc.** Bricklin, Frankston, Software Arts. Electronic work sheet for any problem involving numbers, rows, and columns. No programming necessary. VisiCorp, 2895 Zanker Rd., San Jose, CA 95134. $250. *10/80.*

VisiCalc Advanced IIe. Virtually the same as advanced version for the Apple III. Create spreadsheet templates, provide uniform approach to forecasting, budgeting, and planning tasks for an entire organization. VisiCorp, 2895 Zanker Rd., San Jose, CA 95134. $400.

Communications

ASCII Express: The Professional. Robbins, Blue. Greatly improved version of original modem software package features automatic redial, individual macro files, and conversion of Integer, Applesoft, or binary programs into text files. Works with a plethora of hardware. United Software Industries, 1880 Century Pk. E., Los Angeles, CA 90067. $129.95. *12/82.*

Data Capture 4.0. Copyable, modifiable smart terminal program; compatible with Apple III and most lower-case adapters. Southeastern Software, 6414 Derbyshire Dr., New Orleans, LA 70126. $65. *7/81.*

Hayes Terminal Program. Standalone disk designed for the Micromodem II lets CP/M, DOS 3.3, and Pascal disks create, list, delete, send, and receive files. Opens access to nonkeyboard ASCII characters and prints incoming data as it's displayed. Hayes Microcomputer Products, 5835 Peachtree Corners East, Norcross, GA 30092. $99. *9/81.*

Z-Term: The Professional. More than an update. Compatible with a great variety of modems, interface cards, and screen modes. Simple file transfer with integrity. United Software Industries, 1880 Century Pk. E., Los Angeles, CA 90067. $149.95. *5/81.*

Fantasy

Role-playing games involving characters that develop through experience in adventuresome stories, and whose actions players determine via set commands.

• **Beneath Apple Manor.** Worth. The original dungeon game for the Apple, created in 1978. Newly released version has hi-res, sound effects, a few more magic items, but still the classic game. Quality, 21601 Marilla St., Chatsworth, CA 91311. $29.95. *2/83.*

Exodus: Ultima III. British. Super third installment of *Ultima* saga. Contains many features not found in *Ultima II*. Original score, wind and wave motion, four characters who can interact, tactical combat, and full-color dungeons combine with much more solid, involved plot to make an engrossing fantasy. Origin Systems, Box 99, N. Andover, MA 01845. $54.95. *11/83.*

Knight of Diamonds. Greenberg, Woodhead. Second scenario of *Wizardry*, requiring thirteenth-level characters from the original. Individual quests on each of six dungeon levels. Great. Sir-tech, 6 Main St., Ogdensburg, NY 13669. $34.95. *7/82.*

Legacy of Llylgamyn. Greenberg, Woodhead. Third scenario in classic *Wizardry* series. To save Llylgamyn, descendants of the adventurers of other Wizardry scenarios (requires *Overlord*) must wrest a mystical orb from the dragon L'kbreth. New full-screen dungeon, Lisalike information screens. Sir-tech, 6 Main St., Ogdensburg, NY 13669. $39.95. *7/83.*

• **Odyssey: The Compleat Apventure.** Clardy. Fantasy adventure far beyond one place and one setting. Castles, catacombs, an ocean voyage, and the orb of power. Synergistic, 830 N. Riverside Dr., #201, Renton, WA 98055. $30. *10/80.*

Standing Stones. Schmuckal, Sommers. Fifteen levels, 200 monsters, humor, and 3-D perspective in dungeon role-playing adventure. Electronic Arts, 2755 Campus Dr., San Mateo, CA 94403. $40.

• **Temple of Apshai.** Lead title in Dunjonquest series, winner 1981 Academy of Adventure Gaming Arts and Design "Computer Game of the Year" award. Epyx/Automated Simulations, 1043 Kiel Ct., Sunnyvale, CA 94086. $39.95.

• **Ultima.** British. Hi-res color adventure, progressing from Middle Ages to beyond the space age. A masterpiece. California Pacific, 757 Russell Blvd., Davis, CA 95616. $39.95. *6/81.*

Ultima II. British. Faster play in a bigger universe with a time-travel option. Typically British look and feel. Events are much more interdependent; larger realm of fantasy with more transactions available. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $59.95.

• **Wilderness Campaign.** Clardy. First fantasy game to leave the dungeon for the great outdoors; first in hi-res; first to bargain with merchants; and more. Synergistic, 830 N. Riverside Dr., #201, Renton, WA 98055. $17.50.

• **Wizardry.** Greenberg, Woodhead. Ultimate role-playing fantasy; ten-level maze in hi-res. Generate 20 characters, six at a time on expeditions. Gripping game; superbly reproduced. Sir-tech, 6 Main St., Ogdensburg, NY 13669. $49.95. *8/81.*

Graphics

Alpha Plot. Kersey, Cassidy. Hi-res graphics and text utility with optional xdraw cursor and propor-

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tional spacing. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $39.50.

✓ **Apple Dot Matrix Printer Utilities.** Vilberg, Vilberg. Generates alternate character sets for the DMP. Edit characters, change printer specifications, and convert hi-res fonts from other programs for printing. Excellent, easy to operate. Requires Apple Parallel Interface Card or Grappler+. Vilberg Brothers Computing, Box 72, Mount Horeb, WI 53572. $50. *2/84.*

Fontrix. Boker, Houston. Character generator creates unlimited number of typefaces, uses them to write on a screen extended 16 times. Extremely significant development in graphics. Data Transforms, 616 Washington St., #106, Denver, CO 80203. $75. *7/83.*

The Graphics Magician. Jochumson, Lubar, Pelczarski. Outstanding animation package consisting of picture editor and shape-table extender. Comes with utility program to transfer binary files. Penguin, Box 311, Geneva, IL 60134. $59.95. *5/82.*

• **LPS II.** Superb hi-res-graphics drawing system with light pen. Draw freehand or use circles and lines to create geometric shapes. Fill routine with colors and patterns; fun animation demo; programmable Pentrak driver. Gibson, 23192-D Verdugo Dr., Laguna Hills, CA 92653. $349. *10/82.*

Pixit. Darooge. Easily manipulate and combine shapes. Helps you build and modify Applesoft shape tables and use them in programs. Listable. Baudville, 1001 Medical Park Dr. S.E., Grand Rapids, MI 49506. $49.95. *1/84.*

Zoom Grafix. Holle. Graphics-printing utility allows display of picture on-screen prior to print; prints out selected portion at any size. Phoenix, 64 Lake Zurich Dr., Lake Zurich, IL 60047. $39.95. *2/82.*

Home

Bowling Data System. Data Dynamics. Two-disk record-keeping and report-preparation program for infinite number of leagues, up to 40 teams. Weekly recap, season average, more. Rainbow Computing, 9719 Reseda Blvd., Northridge, CA 91324. $149.95.

• **Crossword Magic.** Crossword puzzle maker. Choose subject, words, and clues; program automatically connects words. Play on-screen or make printout. L&S Computerware, 1589 Fraser Dr., Sunnyvale, CA 94087. $49.95. *10/81.*

Dollars and Sense. Mullin. Establishes budgets, writes checks, reminds to pay bills. Uses graphs, reports to analyze cash flow, balance sheets, make year-to-date summaries, expense projections. Monogram, 8295 S. La Cienega Blvd., Inglewood, CA 90301. $100.

The Eating Machine. Thorne. System designed to teach the analysis and planning of meals. Uses bar graphs and happy faces to gauge your calorie, vitamin, mineral intake and to show what percentage of total calories came from various food groups. Crude graphics, good documentation. Muse Software, 347 N. Charles St., Baltimore, MD 21201. $49.95. *1/84.*

Family Roots. Professional genealogy database with unlimited records capability. Unprotected; works with 80-column and u/lc. Extensive documentation. Quinsept, Box 216, Lexington, MA 02173. $185.

✓ **Fax.** Craven, Tolomei. Timed trivia game for one or two players has three skill levels and four question categories: entertainment, sports, history, grab bag. Very challenging. Epyx/Automated Simulations, 1043 Kiel Ct., Sunnyvale, CA 94089. $29.95. *2/84.*

Golf League Statistics. McQuinn. Manages, displays, and prints golf league statistics for up to 50 players and 20 teams. Tracks more than 100 statistics for each player in league. Disk Depot, 731 W. Colorado Ave., Colorado Springs, CO 80905. $139.95.

Home Accountant. Schoenburg. Thorough, powerful home finance program. Monitors five checking accounts against a common budget, plus credit cards and cash; one-step record or transfer of funds. Continental, 11223 S. Hindry Ave., Los Angeles, CA 90045. $74.95. *4/82.*

The Mad Poet. North. Generates haikulike poems, illustrated with colorful graphics. Poor audio. Passive entertainment, can be used with a printer. Matrix Information Systems, 11728 Avon Way, Los Angeles, CA 90066. $14.95. *1/84.*

Micro Cookbook. Recipe-management system allows entry and modification; selection of recipes by common ingredients, name, or classification. Calorie and nutrition guide. Virtual Combinatics, Box 755, Rockport, MA 01966. $40. *6/83.*

Music Construction Set. Harvey. Interactive music composition and learning tool allows user to create music or experiment with included music library. Electronic Arts, 2755 Campus Dr., San Mateo, CA 94403. $40. *12/83.*

✓ **Songwriter.** Bardige, Wantman. Fun, easy-to-use music-creation program teaches musical concepts but doesn't use standard notation, cannot produce harmonies. Good for beginners. Scarborough Systems, 25 N. Broadway, Tarrytown, NY 10591. $59.95. *2/84.*

Tax Mini-Miser. Sunrise. Tax-planning package computes six tax strategies over one year or one strategy up to six years. Starsoft, 4984 El Camino Real, #125, Los Altos, CA 94022. $295.

Tax Preparer. Record-keeping program with wide variety of federal tax forms and schedules; creates itemized lists. Yearly updates. Howard Software, 8008 Girard Ave., #310, La Jolla, CA 92037. $225. *3/81.*

ThinkTank. Idea processor program allows you to see ideas in outline form. Outline can be collapsed to

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see the big picture or expanded to reveal hidden details. Living Videotext, 1000 Elwell Ct., #232, Palo Alto, CA 94303. $150. *8/83.*

Home-Arcade

Fast-action skill games; may include elements of fantasy.

A.E. Horai. Blast away like mad in 3-D. Time the release and detonation of missiles and repel the next wave. Innovative graphics, new firing technique, and fugues to boot. Broderbund, 17 Paul Dr., San Rafael, CA 94903. $29.95. *2/83.*

• **Alien Rain**. Suzuki. Monsters in this classic seem to take it personally when you gun down one of their own kind. Broderbund, 17 Paul Dr., San Rafael, CA 94903. $29.95. *9/81.*

• **Apple Panic.** Serki. Rid a five-story building of crawling apples and butterflies by running up and down connecting ladders, digging traps, then covering critters before they devour you. Extremely addictive, excellent hi-res play. Broderbund, 17 Paul Dr., San Rafael, CA 94903. $29.95. *9/81.*

✓ **Aquatron.** Gray. Smoothly executed, playable descendant of Defender. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $29.95. *2/84.*

The Arcade Machine. Jochumson, Carlston. Step-by-step arcade-game designer—shapes, scoring, sound, and titles. Begin with variations on five games included, then on to your own. Broderbund, 17 Paul Dr., San Rafael, CA 94903. $59.95. *11/82.*

Beagle Bag. Kersey. Twenty games and miscellany, written in Basic and unprotected. Great humor, good two-player games. Manual is worth the price of admission. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $29.50. *1/83.*

Bouncing Kamungas. Becklund. Sound is okay, animation good, premise original, action intense. One of Penguin's best arcaders. Penguin, Box 311, Geneva, IL 60134. $19.95. *12/83.*

Cavern Creatures. Lowrance. Avoid cavern-dwelling snakes and monsters in your fast, maneuverable ship just to slam into a cavern wall or run out of fuel. Good joystick control. Has its faults. Datamost, 8943 Fullbright Ave., Chatsworth, CA 91311. $29.95. *1/84.*

✓ **Centipede.** Save the mushroom patch from invading centipedes, scorpions, spiders, and fleas in Apple rendition of arcade classic. Atarisoft, 1265 Borregas Ave., Box 427, Sunnyvale, CA 94086. $34.95.

• **Choplifter.** Gorlin. Fly your chopper to rescue 64 hostages, avoiding interceptor jets, homing mines, and tanks. Challenging, realistic, and playful. Stunning graphics. Broderbund, 17 Paul Dr., San Rafael CA 94903. $34.95. *7/82.*

Crisis Mountain. Schroeder. Run, crawl, walk, and leap through mountain maze fraught with rolling rocks, geysers, and chasms; defuse nuclear devices. Synergistic, 830 N. Riverside Dr., #210, Renton, WA 98055. $34.95. *10/82.*

• **Crossfire.** Sullivan. Critters come at you from four directions on a grid laid out like city blocks. Strategy and intense concentration required. Superb, smooth animation of a dozen pieces simultaneously. One of the great ones. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $29.95. *1/82.*

Cubit. Oswal. An adult, well-made interpretation of classic cube-hopping game. Clean-lined graphics; requires strategy. Micromax, 6868 Nancy Ridge Dr., San Diego, CA 92121. $39.95. *10/83.*

✓ **Defender.** Fly and shoot, fly and shoot, and don't forget to save the planet. Atarisoft, 1265 Borregas Ave., Box 427, Sunnyvale, CA 94086. $34.95.

✓ **Dig Dug.** Dig Dug moves horizontally and vertically, burrowing tunnels in search of vegetables. Hidden monsters make his task tougher. Atarisoft, 1265 Borregas Ave., Box 427, Sunnyvale, CA 94086. $34.95.

Dino Eggs. Schroeder. Warp into the prehistoric past to save baby dinosaurs from extinction. Avoid snakes and spiders by climbing and jumping from peak to precipice while building fires to ward off the dreaded Dino Mom. Loads of Mesozoic fun. Micro Lab, 2699 Skokie Valley Rd., Highland Park, IL 60035. $40. *8/83.*

✓ **Donkey Kong.** Mario the carpenter climbs girders and rides elevators to reach the top of a building where a giant gorilla holds his sweetheart captive. Try to keep him from falling or getting bumped off. Atarisoft, 1265 Borregas Ave., Box 427, Sunnyvale, CA 94086. $34.95.

Drol. Ngo. Charming rescue mission set in a dream world with witch doctors, Garfield-like scorpions, kamikaze vacuum cleaners. Marvelous, smoothly animated graphics; challenging and playable. Broderbund, 17 Paul Dr., San Rafael, CA 94903. $34.95. *12/83.*

• **Epoch.** Miller. Superbly stylized animation enhances this filmic shoot-'em-up. Tremendous sense of being in space; neat classical music and dramatic time-warp sequences. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $34.95. *10/81.*

Frogger. Lubeck. Not even close. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $34.95. *12/82.*

• **Gorgon.** Nasir. Fly over planet shooting and dodging invaders and saving kidnapped inhabitants. Outstanding hi-res graphics, challenging refueling sequence. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $39.95. *8/81.*

Hard Hat Mack. Abbot, Alexander. Poor Mack. He must avoid vandals, inspectors, falling rivets, and hungry cement mixers to complete his building. Electronic Arts, 2755 Campus Dr., San Mateo, CA 94403. $35. *7/83.*

Lode Runner. Smith. 150 unique levels in super run-climb-dig-jump game—or design your own puzzles, scenes, and setups—in quest to retrieve stolen gold from the Bungeling Empire. Use monkey bars, trap doors, and ladders to your advantage. Broderbund, 17 Paul Dr., San Rafael, CA 94903. $34.95. *8/83.*

• **Meteoroids (Asteroids) in Space.** Wallace. Make little asteroids out of big ones, plus occasional hostile alien ships. Hyperspace, autobrake, autofire. Quality, 21601 Marilla St., Chatsworth, CA 91311. $19.95.

• **Microsoft Decathlon** (formerly *Olympic Decathlon*). Smith. Ten standard decathlon events. Hi-res animated athletes, muscle-stirring music; you provide the sweat. Microsoft, 10700 Northup Wy., Bellevue, WA 98004. $29.95. *6/81.*

Miner 2049er. Livesay, Hogue. Run, jump, climb, and slide through the mines, reinforcing the groundwork along the way. Elevators, cannons, chutes, and ladders help; mutants don't. Hot stuff, best of the genre. Micro Lab, 2699 Skokie Valley Rd., Highland Park, IL 60035. $39.95. *1/83.*

Pac-Man. Official, original eat-'em-up arcade giant now available for the Apple II. Atari, Box 2943, S. San Francisco, CA 94080. $34.95.

Pinball Construction Set. Budge. Design and play your own computer games on-screen, with zero programming. A miracle of rare device. Superior. BudgeCo, 428 Pala Ave., Piedmont, CA 94611. $39.95. *2/83.*

• **Pool 1.5.** Hoffman, St. Germain, Morock. Makes most shots you could on a real pool table, with the advantages of instant replay and slow motion. Four different games. IDSI, Box 1658, Las Cruces, NM 88004. $34.95. *6/81.*

• **Raster Blaster.** Budge. First realistic pinball game. *Softalk* readers' Most Popular Program of 1981. BudgeCo, 428 Pala Ave., Piedmont, CA 94611. $29.95. *5/81.*

✓ **Robotron: 2084.** The world's turned bad 100 years later than expected. Save the last of the race from marauding robot monsters. Atarisoft, 1265 Borregas Ave., Box 427, Sunnyvale, CA 94086. $34.95.

✓ **Shamus.** Mataga. Try to penetrate The Shadow's lair in order to kill him in complex mystery maze game. Four levels, 32 rooms per level. Synapse Software, 5221 Central Ave., Richmond, CA 94804. $34.95.

• **Sneakers.** Turmell. Many-layered shooting game; one of the best. Stomping sneakers and other creatures requires varying techniques. Fun. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $29.95. *9/81.*

Spare Change. Zeller, Zeller. Bright graphics, ultrasmooth animation, clever sound effects, and cute characters add up to create an instant classic—the first computer slapstick comedy. Broderbund, 17 Paul Dr., San Rafael, CA 94903. $34.95. *11/83.*

Stellar 7. Slye. It's you against the Arcturan world in excellent 3-D animated arcader. Seven levels, 14 types of enemies to blast in quest of the alien armada. Software Entertainment, 537 Willamette St., Eugene, OR 97401. $34.95. *9/83.*

Stickybear Basketbounce. Worthington, Hefter, Worthington. Involving fun for the whole family features 16 challenging screens, a handsome bear, and no shooting, squishing, or hacking. Just dandy. Weekly Reader Family Software, 245 Long Hill Rd., Middletown, CT 06457. $39.95. *10/83.*

Super Bunny. Leone. Help Reginald Rabbit ingest magic carrots and metamorphose into Super Bunny. Hop from elevator to elevator to defend Bunnyville from hostiles. Datamost, 8943 Fullbright Ave., Chatsworth, CA 91311. $29.95. *1/84.*

• **Super Invader.** Hata. Progenitor of home arcades. Still good hi-res, still a challenge. *Softalk* Readers' Most Popular Program of 1978-80. Astar International, through California Pacific, 757 Russell Blvd., Davis, CA 95616, and Creative Computing, 39 E. Hanover Ave., Morris Plains, NJ 07960. $19.95.

• **Wayout.** Exciting 3-D maze that moves in perspective as you play. Map displayed at all times. Lots of angles and cleptangles. Separate version for IIe. Exquisite motion animation is a breakthrough. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $39.95. *10/82.*

Zaxxon. Garcia. 3-D scrolling air raid brought to the Apple with little sacrifice in playability. Datasoft, 9421 Winnetka Ave., Chatsworth, CA 91311. $39.95. *9/83.*

Home Education

Algebra 1–4. EduWare. Sets of learning units progressing from algebraic rules to definitions to graphing and inequalities. Individualized teaching styles to fit everyone's needs. Good for adults wanting to overcome math anxiety as well as for schoolkids. Peachtree Software, 3445 Peachtree Rd., N.E., #830, Atlanta, GA 30326. $39.95 each. *Algebra 1, 5/81.*

Alphabet Zoo. Disharoon. Two programs in one. The first helps young children match letters with sounds. In the second, school-age kids move through a maze, selecting letters that spell words introduced in the first part. Generally good sound and graphics, animal motif. Spinnaker Software, 215 1st St., Cambridge, MA 02142. $29.95. *1/84.*

Apple Logo. Papert. Custom version (by its inventor) of turtle graphics language. First-rate educational tool. Great kid-friendly documentation. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $175.

Arcademic Skill Builders in Language Arts. Chafin. *Word Invasion*, *Word Master*, *Word Radar*, *Word Man*, *Verb Viper*, *Spelling Wiz*. Lots of action and great detailed graphics in arcade-style vocabulary building games. Comes with teaching package. Developmental Learning Materials, 1 DLM Park, Allen, TX 75002. $44 each. *7/83.*

Arcademic Skill Builders in Math. Chafin, Maxwell. *Alien Addition*, *Alligator Mix*, *Demolition Division*, *Dragon Mix*, *Meteor Multiplication*, and *Minus Mission*. Arcade action blended with addition, subtraction, multiplication, and division problems. Shooting correct answers to problems gets rid of

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- "The program has proved the hype of Money Street is really too modest." Dan Thomas, Elgin, Ill.
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- "I think the phrase 'as promised' sums up my reaction to the program. I wound up balanced to the penny. This from someone who hasn't looked at a bank statement in ten months!" Glenn Pironlick, Charlotte, NC.
- "I'm impressed with the well conceived error-trap warnings. Also it instills confidence having every exit move also a save move." Edward Simmons, Los Angeles, Calif.
- "I'm very pleased with Money Street and can easily recommend it to others. It is fun to use, and, at the same time, very practical and time saving."Henry Poterucha, M.D., Effingham, ILL.
- "I've tried seven other checkbook programs and have not had the satisfaction that I have with this one." Leo Wong, D.D.S., Calgary Canada.
- "In my law office, the real cost of a program is the time it takes to learn and set it up. Money Street is great." Buzz Bruggerman, Orlando, FL.
- "The program is both easy to use and a very helpful addition to my software library. The most useful features are the automatic totaling of categories and the automatic retrieval of split entries." Louis Wofsy, Burk, Virginia.

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2. Saves CPA write-up fees.
3. Allows "before year-end" tax planning.
4. Saves accounting time; provides input for journals, ledgers, and reports. The program also doubles as a mini-accounts receivable, inventory keeper, and job cost system.
5. Saves interest expense by keeping exact balances.
6. Saves NSF charges.
7. Saves credit card interest charges.
8. Changes your financial attitudes; puts you in control.

PROGRAM FEATURES

● 100 user-defined accounts ● On screen chart of accounts ● Account sub totals, grand totals ● Handles unlimited checking accounts ● Three minuta year-end rollover ● Credit card accounting ● Full editing, aven after entry ● Check search and scan screen ● Help screen ● Wildcard searches

PROGRAM LIMITS

● 2400 Checks per data disk ● 200 uncleared items ● Scan speed: 6 per second ● Amount limit: $999,999.99 ● 100 account categories

DOES MANY JOBS

● Finds tax deductions ● Singla antry accounting ● Jbb costing ● Budgets and estimates ● Mini accounts receivable ● Mini inventory ● Tracks personal loans ● Real estata rentals ● Stock purchases/ sales ● Increases "float"

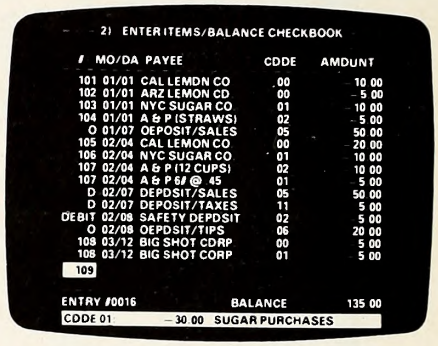
CHECKING ACCOUNT MANAGER

● Prints trial reconciliation ● Balances checkbook and statement ● Creates cancelled check file ● Prints detailed audit trail ● Includes check register ● Prints checkbook "history" ● Captures monthly income ● Easy to use

15 Ready-to-print reports!

● Monthly code totals ● To-data code totals ● Sort by amount ● List code dictionary ● List by payee ● List deposits ● List uncleared checks ● List unclaared deposits ● List all entries ● Sort by date cleared ● Print check registry ● Print selected month ● Print selected code ● List code totals ● List monthly totals

How it works On your computer screen, you create a facsimile of your checkbook. You see 17 items per screen and can scroll for more. As the computer balances your checking account, you give each check or deposit its own category code. You get 100 you name'em codes. Press Ctrl-O and see a code dictionary. To set up codes, just type them in. You can add, delete, or change codes any time without affecting data.



Money Street's most amazing feature is its "real time" data bank. It accumulates year-to-date totals for each of the 100 categories. You see these totals instantly. Just enter a check, and look at the bottom of the screen. The year-to-date total will flash into view with each new entry.

Pays for itself. Money Street keeps things simple and keeps them honest. It can pay for itself ten times over just by saving the cost of organizing and totaling data. As one customer put it: "Why pay my $100-an-hour CPA to count beans?"

Money Street...It's totally new. If you own real estate, Money Street tracks rents, tallies repair costs, and helps establish "cost basis" for capital gain tax treatment. It's also ideal for trust accounting, retail stores, and home budgeting.

Money back no matter what. Why not give us a try? If you aren't delighted, we'll give you a full refund on any mail order purchase from us.

Includes tutorial and program map. Money Street includes Program Map, complete documentation, on-screen demo, plus tutorial. For Apple® II, II+, IIe, III emulation, and Apple look-alikes. Requires 3.3 DOS, 48K. Money Street works with one drive, but two are preferred. It's also okay without a printer, but you'll miss a few reports. Master Charge, Visa, COD okay. Add $2.50 on all orders for postage and packing. To order or get additional information: call 24 hours and leave your name with our answering machine.

The program is copy protected. We sell back-up disks for $10. We also offer a special utility disk that makes two back-up copies, tranfers code labels, and allows screen sorts of a single month or code category. Price is $25.

Computer Tax Service
P.O. Box 7915
Incline Village, NV 89450
(702) 832-1001

$99.95

Dealers: Write or call for price list.

pesky attackers. Choose speed, difficulty levels, game length. Developmental Learning Materials, 1 DLM Park, Allen, TX 75002. $29.95 each. *7/83.*

Arithmetic Skills. EduWare. Helps children establish a strong foundation in basic math skills, computer literacy. Covers counting, addition, subtraction, multiplication, and division. Pass-fail ratios can be parent-defined. Peachtree Software, 3445 Peachtree Rd., N.E., #830, Atlanta, GA 30326. $49.95.

Cdex Training for the Apple IIe. Zunkel. Self-paced, graphically oriented training program. Cdex, 5050 El Camino Real, Los Altos, CA 94022. $59.95, three disks.

Compu-Read. EduWare. Set of programs develops speed and retention in reading. Stresses character and word recognition, comprehension. Peachtree Software, 3445 Peachtree RD., N.E., #830, Atlanta, GA 30326. $29.95.

Compu-Spell. EduWare. Teaches spelling through positive reinforcement for grades four through eight. Program keeps a file to monitor spellers' progress. Additional unit designed for adult user included. Peachtree Software, 3445 Peachtree Rd., N.E., #830, Atlanta, GA 30326. Program and one data disk, $39.95. Additional disk, $19.95. *5/81.*

Computer SAT. Prepares college-bound students for admittance test. Diagnoses strengths, weaknesses; creates study plan, exercises. Harcourt Brace Jovanovich, 1250 6th Ave., San Diego, CA 92101. $79.95.

Counting Bee. Conrad. Introduces young children to counting, addition, subtraction, shape discrimination, weight, and measurement. Ages four to eight. Peachtree Software, 3445 Peachtree Rd., N.E., #830, Atlanta, GA 30326. $29.95.

Decimals. EduWare. Master those elusive decimals. Eight programs including pretest and learning units directed at conversion, addition, subtraction, rounding off, multiplication, division, and percentage. Peachtree Software, 3445 Peachtree Rd., N.E., #830, Atlanta, GA 30326. $39.95.

Delta Drawing. Kids can make colorful drawings by using single-key commands. No special talent needed; this one develops programs that create complex graphics. Spinnaker, 215 1st St., Cambridge, MA 02142. $59.95. *11/82.*

Early Games for Young Children. Paulson. Basic training in numbers, letters, Apple keyboard for children ages two to seven with no adult supervision. Has a neat little drawing program. Counterpoint Softpoint Software, 4005 W. 65th St., Minneapolis, MN 55435. $29.95. *2/84.*

Early Games Fraction Factory. Eyestone. Aided by colorful graphics and music, children see and describe fractions, find equal values with different denominators, multiply whole numbers by fractions, add and subtract fractions. Ages 8 to 12. Counterpoint Software, 4005 W. 65th St., Minneapolis, MN 55435. $29.95.

✓ **Early Games Matchmaker.** Adolf, Boody. Helps children aged two to six develop matching, grouping, and discrimination skills. Requires no knowledge of keyboard; does require adult supervision. Counterpoint Software, 4005 W. 65th St., #218, Minneapolis, MN 55435. $29.95. *2/84.*

Early Games Music. Paulson. Illustrates music with fun and theory. Children compose music and set to graphics or learn note reading and piano keyboard. Counterpoint Software, 4005 W. 65th St., Minneapolis, MN 55435. $29.95. *8/83.*

Early Games Piece of Cake. Eyestone. Kids become baker's assistants; adding, multiplying, subtracting, dividing cakes. Includes CatchaCake, a problem-solving race against time to stop a cake from falling. Counterpoint Software, 4005 W. 65th St., Minneapolis, MN 55435. $29.95. *10/83.*

✓ **Edu-Cave.** Zunker. Answer questions on geography, spelling, and arithmetic, or use customized questions in two-disk educational arcade adventure. Micro Program Designs, 5440 Crestline Rd., Wilmington, DE 19808. $29.50. *2/84.*

Electronic Playground. Tunnell. Three programs on one disk include Matchbox: a game requiring kids to recognize similar shapes, capital and lower-case letters, and count to nine; Magic Blackboard: a drawing and coloring program; and Heidi's Program: a kaleidoscope of color and movement controlled by the user. Straightforward, competent—a good deal. For ages 3-8. Software Entertainment, 537 Willamette St., Eugene, OR 97401. $24.95. *2/84.*

Facemaker. DesignWare. Exercises kids' creativity and introduces programlike command sequencing as kids create faces and link them together in animated patterns. Spinnaker, 215 1st St., Cambridge, MA 02142. $34.95.

Factor Blast. DeMuth. Select difficulty level, keyboard or paddle control, human or computer opponent, and begin blasting. One player directs a laser dish to blast a number on the screen; the other must blast a factor of that number. Aids in memorization, enhances math ability. Hayden Software, 600 Suffolk St., Lowell, MA 01853. $29.95. *1/84.*

The Fourth Leg of the Apple. Brinker. Combination text and disk tutorial explains hexadecimal system, Apple's circuitry and memory, and the 6502 microprocessor. Includes an overview of languages, a Forth tutorial, and a chapter on assembly language programming. Brinker Computing, 2775 Tessmer Rd., Ann Arbor, MI 48103. $49.95. *1/84.*

Fractions. EduWare. Hi-res addition, subtraction, multiplication, and division of fractions. With learning manager system. Peachtree Software, 3445 Peachtree Rd., N.E., #830, Atlanta, GA 30326. $49.

• **French Hangman, Latin Hangman, Spanish Hangman.** Protelsch, Earl. Hangman games that tell you the answer—in a foreign language. Interesting sentences, many formats. Addicting! George Earl, 1302 S. General McMullen, San Antonio, TX 78237. Two-sided disk, $29.95. *9/83.*

Game Show. Guess mystery words from clues given by "celebrity" partners—no threat to Liz Montgomery. Fifteen subjects cover vocabulary, history, algebra, and more. Add topics. Computer-Advanced Ideas, 1442A Walnut St., #341, Berkeley, CA 94709. $39.

• **Gertrude's Secrets.** Gertrude the Goose teaches four- to nine-year-olds shape and color relationships. Solve logic puzzles, create forms. The Learning Co., 545 Middlefield Rd., #170, Menlo Park, CA 94025. $44.95. *2/83.*

The Grabit Factory. Box, Box. Easily controlled math game for ages five to eight. Student-controlled crane lifts numbers from a conveyor belt to perform number recognition, addition, or subtraction tasks. A grabber any way you look at it. Eric Software, 1713 Tulare, Fresno, CA 93721. $39.95. *1/84.*

Hey Diddle Diddle. Disharoon. Three reading and vocabulary games that strengthen reasoning ability. Ages 3 to 10. Spinnaker, 215 1st St., Cambridge, MA 02142. $29.95.

In Search of the Most Amazing Thing. Snyder. Role-playing game lets kids negotiate with aliens, fly hot-air balloon. Ages 10 to adult. Spinnaker, 215 1st St., Cambridge, MA 02142. $44.95. *7/83.*

Kindercomp. Learning exercises for ages three through eight. Spinnaker, 215 1st St., Cambridge, MA 02142. $29.95.

Krell Logo. Concentrates on underlying principles of Logo; sections on assembly language interfaces and music creation, plus Alice in Logoland tutorial. Krell, 1320 Stony Brook Rd., Stony Brook, NY 11790. $89.95. *7/82.*

• **MasterType.** Zweig. Learn to type by playing a game; simple and ingenious. IIe version teaches new keyboard. Lightning, Box 11725, Palo Alto, CA 94306. $39.95. *4/81.*

• **The New Step by Step, Step by Step Two.** *The New Step by Step* teaches beginning programming.

Step by Step Two teaches intermediate Basic programming, peek and poke, hexadecimal numbers, concatenations, and more. Program Design, 11 Idar Ct., Greenwich, CT 06830. $89.95. *7/83.*

Plato Decimals. Arcade-style decimal tutorial that automatically adjusts difficulty to child's performance. For elementary math students. Control Data, Box 261127, San Diego, CA 92126. $45.

Plato Fractions. Correct use of fractions breaks balloons in elementary school-level tutorial. Features automatic adjustment of difficulty level. Control Data, Box 261127, San Diego, CA 92126. $45.

Plato High School Skills. Helps high school level students master foreign languages, reading, English, math, social studies, science, and computers. Can assist students preparing for the G.E.D. exams. Control Data, Box 261127, San Diego, CA 92126. Each lesson, $45.

Rhymes and Riddles. Cross. Four games to teach reading and spelling to elementary schoolchildren. Fill in the blanks with the necessary phrase. Spinnaker, 215 1st St., Cambridge, MA 02142. $29.95.

Rocky's Boots. Robinett, Grimm. Rascally raccoon helps children build logical thinking and computer understanding. Construct machines of logical gates in convolutions of thickening complexity. Music and sound effects add to fun. The Learning Co., 545 Middlefield Rd., #170, Menlo Park, CA 94025. $49.95. *2/83.*

SAT Word Attack Skills. Priven. Teaches college-bound students testing skills, vocabulary, and methods of deciphering unfamiliar words. Peachtree Software, 3445 Peachtree Rd., N.E., #830, Atlanta, GA 30326. $49.

Shifty Sam. Baird, Ingram. Fast-moving game for ages eight to adult. Shifty Sam, a feisty casino dealer, challenges one or two players to a word battle. Different graphics. Develops word recognition, vocabulary, and spelling skills. Random House, 7307 S. Yale St., #103, Tulsa, OK 74136. $39.95.

Snooper Troops. Snyder. Ongoing hi-res mystery series in form of educational games. Highly structured; excellent fourth-through-eighth-grade educational tool. Fun for adults too. Spinnaker, 215 1st St., Cambridge, MA 02142. $44.95 each. *9/82.*

Spellakazam. Confronted with a sentence that's missing a word, you race a magician through a maze, picking up the letters to spell the word correctly. If the magician beats you to the magic hat you get fewer points, but accuracy is more important than speed. Variable skill level. DesignWare, 185 Berry St., San Francisco, CA 94107. $39.95. *1/84.*

Spellicopter. UFOs try to stop player's helicopter from picking up letters to form words in latest spellicader. Slow in spots, not up to top arcade standards, but will help kids through spelling doldrums. DesignWare, 185 Berry St., San Francisco, CA 94107. $39.95. *12/83.*

Spelling Bee Games. EduWare. Hi-res games strengthen eye-hand coordination, memory, motor skills. Word lists include shapes, animals, more. Peachtree Software, 3445 Peachtree Rd., N.E., #830, Atlanta, GA 30326. $29.95. *5/83.*

Square Pairs. Kleiman, Minsuk. Matching games for ages seven through twelve. Includes feature for creating your own games. Scholastic, 906 Sylvan Ave., Box 2010, Englewood Cliffs, NJ 07632. $39.95. *9/83.*

Stickybear. Hefter, Worthington, Rice, Howe. Animated early education programs. In *Stickybear ABC*, moving pictures with sound represent letters. In *Stickybear Numbers*, groups of moving objects teach numbers and simple arithmetic. Ages three through six. In *Stickybear Bop*, ducks, planets, and balloons bop across screen in three shooting galleries. For all ages. In *Stickybear Shapes*, animated pictures teach shape recognition. In *Stickybear Opposites*, Stickybear and friends illustrate opposites. Weekly Reader Family Software, 245 Long Hill Rd., Middletown, CT 06457. $39.95 each. *Numbers, ABC, Bop, 5/83. Shapes, 12/83.*

Story Machine. Helps develop positive attitude toward writing and ability to write correctly. Words come to life when sentence is acted out on-screen. Kids five to nine love to type "The Bumpus zots the tree" and see it do so. Spinnaker, 215 1st St., Cambridge, MA 02142. $34.95.

Success with Math. Ross. Consists of a series of programs: *Addition and Subtraction, Multiplication and Division, Linear Equations*, and *Quadratic Equations*. Nonalgebraic programs test the student's knowledge; algebraic programs instruct by giving hints for solving each problem. Provides an environment for learning and practicing rather than for gaming. One for the self-motivated learner. CBS Software, 1 Fawcett Pl., Greenwich, CT 06836. $24.95 each. *1/84.*

Terrapin Logo. MIT. The Logo language, using a Terrapin turtle to teach state, control, and recursion. Terrapin Inc., 380C Green St., Cambridge, MA 02139. $149.95.

Tic Tac Show. Teaches facts and concepts about the world in general. Solo or double play; add topics. Computer-Advanced Ideas, 1442A Walnut St., Berkeley, CA 94709. $39.95.

Type Attack. Hauser. Learn to type while defending the planet Lexicon from invaders. IIe version teaches IIe keyboard. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $39.95.

Typing Tutor. Ainsworth, Baker. Four levels of proficiency; individualized drills created with time-response monitoring. Microsoft, 10700 Northup Wy., Bellevue, WA 98004. $24.95.

✓ **Wizard of Words.** Neely, Aaronson. Teaches vocabulary and spelling through five word games. Games include *Jester's Jumble*, a variation of anagrams; *Castle Capers*, a type of hangman; *Word Spinning*, a Scrabble-like game; *Herald's Mark*, a mystery word game; and *Dragon's Spell*, a word-creation puzzle. Computer-Advanced Ideas, 1442A Walnut St., #341, Berkeley, CA 94709. $39.95. *2/84.*

Strategy

Thinking, planning, plotting games, from war games to backgammon to cards.

AirSim-3. Kurtz. Update of *AirSim-1* handles like a fast, exciting little airplane. Competitive with the best simulators on the market. Mind Systems, Box 506, Northampton, MA 01061. $44.95. *12/83.*

Bermuda Race. Biddle, Mattox. Excellent yachting simulation of Rhode Island-to-Bermuda race. First-rate graphics, challenging, and exciting. Includes sailing, navigation tutorial; for one or two players. Howard W. Sams, 4300 W. 62nd St., Indianapolis, IN 46268. $29.95. *11/83.*

✓ **Carrier Force.** Grigsby. Four World War II naval scenarios. Realistic reenactment of gut-wrenching battles. For one or two players. Strategic Simulations, 883 Stierlin Rd., A-200, Mountain View, CA 94043. $59.95.

Casino. Five hi-res games, Vegas style: blackjack, baccarat, keno, poker, and roulette. Datamost, 8943 Fullbright Ave., Chatsworth, CA 91311. $39.95. *10/82.*

• **Castle Wolfenstein.** Warner. First game to fuse successfully strategy, home-arcade, fantasy. Escape from Nazi stronghold with secret plans. Room layout changes with each new game. Enemy speaks (in German). Muse, 347 N. Charles St., Baltimore, MD 21201. $29.95. *10/81.*

• **Computer Ambush.** Williger. Gutty soldier-to-soldier street fighting in World War II France. Latest version is 40 times faster than the original, which was one of the best games ever created for Apple, except for slowness. Strategic Simulations, 883 Stierlin Rd., A-200, Mountain View, CA 94043. $59.95.

• **Computer Baseball.** Merrow, Avery. Simulates individual player abilities from the teams of 13 famous World Series. Enter and play teams of your own creation. Strategic Simulations, 883 Stierlin Rd., A-200, Mountain View, CA 94043. $39.95. *9/81.*

Eagles. Raymond. World War I aviators climb, dive, shoot, run for home in historic aircraft. Be either German or Allied ace. Strategic Simulations, 883 Stierlin Rd., A-200, Mountain View, CA 94043. $39.95. *11/83.*

• **Flight Simulator.** Artwick. Uses aerodynamic equations, airfoil characteristics for realistic takeoff, flight, and landing. Two years on Top Thirty. SubLogic, 713 Edgebrook Dr., Champaign, IL 61820. $33.50.

✓ **Flight Simulator II.** Artwick. Update of the original *Flight Simulator* features animated 3-D color graphics, transcontinental flight, World War I aerial battle. SubLogic, 713 Edgebrook Dr., Champaign, IL 61820. $49.95.

Fortress. Denbrook, Templeman. A cross of go and chess. You and your computer opponent build fortresses while seeking to dominate the area represented by the game board. Assemble a quiver of computer opponents, each with its own style of play. Simple to learn, challenging to play. Strategic Simulations, 883 Stierlin Rd., Building A-200, Mountain View, CA 94043. *1/84.*

Geopolitique 1990. Ketchledge, Billings. Diplomatic, economic, and military simulation that pits the United States against the Soviet Union in a struggle for world supremacy. Features two phases: global diplomacy and geowar, a simulation of nonnuclear combat. For one player. Strategic Simulations, 883 Stierlin Rd., A-200, Mountain View, CA 94043. $39.95. *10/83.*

Gin Rummy. Carpet. Play against computer. Hi-res hand can be arranged. Knocking allowed. Computer plays pretty well. Datamost, 8943 Fullbright Ave., Chatsworth, CA 91311. $29.95. *6/82.*

Gnosis VII. Cuba. Fascinating, eminently playable logic puzzle involves quest for the word of power. Eternally replayable, not copy protected. Magnetic Harvest, Box 255, Hopkins, SC 29061. $19.95. *12/83.*

Hi-Res Computer Golf 2. A masterpiece; requires judgment, strategy, and visual acuity. One of the few computer sports simulations that require dexterity. Avant-Garde, Box 30160, Eugene, OR 97403. $34.95. *6/83.*

• **Microgammon II.** Program for play, practice, improvement of backgammon skills. Pretty good competition. Softape, 5547 Satsuma Ave., North Hollywood, CA 91601. $19.95. *2/81.*

Millionaire. Zuber. Investment simulation lets you know if you have what it takes to make a quick million in the stock market. Every little market fluctuation represented on a weekly basis, includes investment tips. Blue Chip Software, 19818 Ventura Blvd., Woodland Hills, CA 91364. $59.95. *12/83.*

✓ **Mystery Master: Murder by the Dozen.** The BrainBank. Twelve unpredictable, challenging cases for one to four players. Secret cluebook is cumbersome, but the fun overcomes all. CBS Software, 1 Fawcett Pl., Greenwich, CT 06836. $34.95. *2/84.*

✓ **One-on-One.** Hammond, Bird, Erving. Graphically and intrinsically captures the moves, grace, and bearing of basketball forwards Dr. J and Larry Bird as they play one on one. The best video basketball imaginable, for one or two players. Electronic Arts, 2755 Campus Dr., San Mateo, CA 94403. *2/84.*

• **Pensate.** Besnard. Chess-type thinking game with new tactics. Computer's many pieces move in relation to player's piece; each of 10 types of computer pieces has unique rules. Makes full use of computer capabilities. Intriguing, progressive, and addictive. Penguin, 830 4th Ave., Geneva, IL 60134. $19.95. *7/83.*

Program X, the Ultimate Puzzle. Gips. Extremely challenging cryptography in brain teaser that lives up to its name. National Software, Box 686, Dover, MA

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Inserts, deletes, types over with instant error recovery	**YES**	no	no
Move and copy almost unlimited text at one time	**YES**	no	no
Prints documents with **bold face,** underlining, etc. via easy to use menu.	**YES**	no	no
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Regatta. DeMuth, Peterson. Select a course, choose light or heavy winds, adjust your sail, and your racing your small sailboat. Takes strategy, patience, and nerve; one for the old salts. Howard W. Sams, 4300 W. 62nd St., Indianapolis, IN 46268. $29.95. *1/84.*

Ringside Seat. Saracini. Who really was the greatest? Find out by managing matches between Joe Louis and Rocky Marciano, or Muhammed Ali and Jack Dempsey, among others. Strategic Simulations, 883 Stierlin Rd., A-200, Mountain View, CA 94043. $39.95. *11/83.*

• **RobotWar.** Warner. Strategy game with battling robots is great teaching device for programming. Muse, 347 N. Charles St., Baltimore, MD 21201. $39.95. *1/81.*

• **Sargon III.** Spracklen, Spracklen. Plays good chess fast. Much improved from *Sargon II*, contains 107 classic games from the past for instruction or entertainment. Hayden, 600 Suffolk St., Lowell, MA 01853. $49.95. *10/83.*

Space Vikings. Robbins. 3-D simulation of space combat. Raid the planets of twenty star systems, gathering loot and establishing bases. SubLogic, 713 Edgebrook Dr., Champaign, IL 61820. $49.95. *3/83.*

Utility

Apple Mechanic. Kersey. Multiple disk utility with shape editor, custom typefonts, byte rewriter, and tricks to facilitate music, text, and hi-res generation. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $29.50. *9/82.*

Apple Mechanic Typefaces. Twenty-six new fonts for use with *Apple Mechanic*. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $20.

Audex. Collection of utilities to create, edit, and play back sounds, in Basic and assembly language. Sirius, 10364 Rockingham Dr., Sacramento, CA 95827. $29.95.

Bag of Tricks. Worth, Lechner. Four utility programs for dumping and examining raw tracks, sector editing, reformatting tracks, and repairing damaged catalogs. Indispensable. Quality Software, 21601 Marilla, Chatsworth, CA 91311. $39.95. *6/82.*

Beagle Basic. Simonsen. Allows you to enhance and customize Applesoft by adding up to 12 functions. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $34.95. *10/83.*

✓ **Diskquik.** Bruce, Hite. Uses an extended 80-column card to make the Apple IIe think a disk drive is connected to slot three. Eighty-column card holds about half as much data as a disk. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $29.50.

DOS Boss. Kersey, Cassidy. Utility to change DOS commands; customize catalog. Good ideas and witty presentation. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $24. *10/81.*

Double-Take. Simonsen. Multiple-utility features two-way scrolling for listings and catalogs. Improved list format. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $34.95. *10/83.*

Einstein Compiler. Goodrow, Einstein. Translates Applesoft programs into machine language for runtime up to 20 times faster. Supports all graphics modes, defined functions, and DOS commands. Einstein, 11340 W. Olympic Blvd., Los Angeles, CA 90064. $129. *5/83.*

Flex Type. Simonsen. Adds graphics to text and vice versa; prints variable-width text with no hardware. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $29.50.

Frame-Up. Weishaar. High-speed display utility generates professional presentations of graphics, text frames. Text screen editor lets you create text slides, add type live during shows. Optional preprogrammed display for unattended shows. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $29.50.

System Saver® didn't become the Apple's number one selling* peripheral by being just a fan.

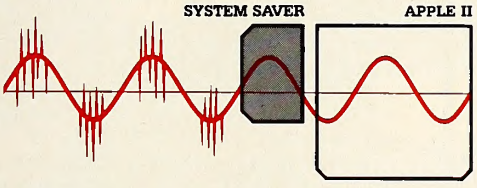
What made over 100,000 Apple® owners fall in love with System Saver? The answer is simple. It's the most versatile, most convenient, most useful peripheral ever made for the Apple.

System Saver filters out damaging AC line noise and power surges.

70-90% of all microcomputer malfunctions can be traced to power line problems.** Problems your System Saver guards against.

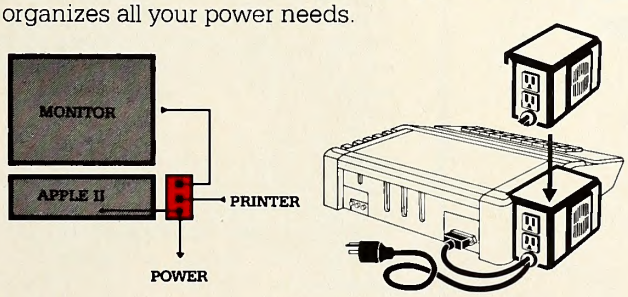
Power line noise can often be interpreted as data. This confuses your computer and produces system errors. Power surges and spikes can cause severe damage to your Apple's delicate circuitry and lead to costly servicing.

System Saver clips surges and spikes at a 130 Volts RMS/175 Volts dc level. A PI type filter attenuates common and transverse mode noise by a minimum of 30 dB from 600 kHz to 20 mHz with a maximum attenuation of 50 dB. You end up with an Apple that's more accurate, more efficient and more reliable.



System Saver makes your Apple more convenient to use.

No more reaching around to the back of your Apple to turn it on. No more fumbling for outlets and cords to plug in your monitor and printer. System Saver organizes all your power needs.

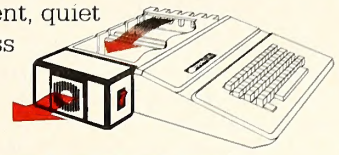


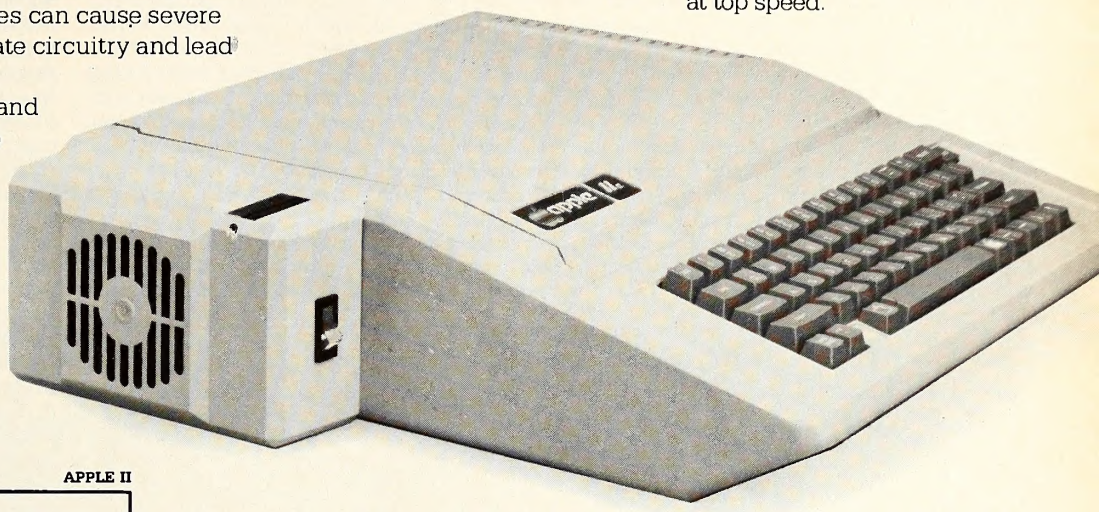
It functions as a multi-outlet power strip with two switched outlets. Plus System Saver offers the ultimate convenience, a front mounted power switch for fingertip control of your entire system.

System Saver lets your Apple keep its cool.

Today's advanced peripheral cards generate heat. In addition, the cards block any natural air flow through the Apple IIe creating high temperature conditions that shorten the life of the Apple and peripheral cards.

System Saver's efficient, quiet fan draws fresh air across the mother board, over the power supply and out the side ventilation slots. It leaves your Apple cool, calm and running at top speed.





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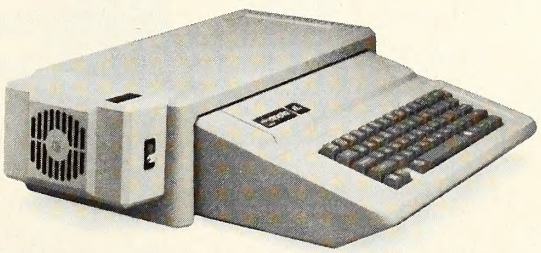

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*Softsel Computer Products Hot List. **PC Magazine: March 1983.

System Saver is UL Listed. System Saver's surge suppression circuitry conforms to IEEE specification 507 1980, Category A. Available in 220/240 Volts, 50/60 Hz.

• **Global Program Line Editor.** Enhanced version of *Program Line Editor* with programmable cursor and listing control. Edit line by line or by range of lines and search for strings. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $49.95. *12/82.*

✓ **Instant Programmer's Guide.** Eddy. KoalaPad software for programmers incorporates use of the graphics tablet into other programs. Koala Technologies, Santa Clara, CA 95050. $15.

Merlin. Does assembly language programming with a dozen editing commands and 28 pseudo-ops. Roger Wagner Publishing, 10761-E Woodside Ave., Santee, CA 92071. $64.95. *1/83.*

ProntoDOS. Weishaar. High-speed disk utility cuts about two-thirds of the time off bload and save functions. Compatible with all DOS commands; frees up to 15 extra sectors per disk. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $29.50.

✓ **ShortCuts.** Puckett. Makes Applesoft more powerful by adding several new commands, capabilities. Provides user with intelligent input/output processor, automatic sorting routine, new ways to control program logic and data formatting. Penguin Software, Box 311, Geneva, IL 60134. $49.95. *2/84.*

✓ **Silicon Salad.** Kersey, Simonsen. Grab bag of utilities including Applesoft error trapper, fast word alphabetizer, and a disk scanner that seals off bad sectors. Features *Tip Disk #2* and *Beagle Blackjack.* Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $24.95.

Sphinx. Software giving single-pass encryption beyond 10 to the 400th power. Crane Hill, Box 273, Gonzalez, FL 32560. $37.50.

• **Super Disk Copy III.** Hartley. Easy-to-use menu-driven software utility; correct file sizes, undelete, free DOS tracks, more. Sensible, 6619 Perham Dr., W. Bloomfield, MI 48003. $30. *10/81.*

T&G. Set of machine language routines that place text, graphics on hi-res screen. Includes three sizes of text characters, graphics editor, tutorial. C & C Software, 5713 Kentford Circle, Wichita, KS 67220. $65.

Tip Disk #1. Kersey. One hundred *Beagle Tip Book* programs on disk. Includes Apple command chart and peeks/pokes chart. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $20.

Utility City. Kersey. Twenty-one utilities on one disk. Beagle Bros, 4315 Sierra Vista, San Diego, CA 92103. $29.50.

XPS-Diagnostic. Peters. Comprehensive hardware diagnostic utility by author of *Apple Cillin* includes graphic display of bad memory chips, tests for printers, RAM, ROM, and peripheral cards. XPS, 323 York Rd., Carlisle, PA 17013. $49.95.

Word Processing

Apple Writer II and IIe. Includes WPL (word processing language). Additional functions menu; continuing features and functions menu; continuous readout of characters and length. *IIe* has shift, shift-lock, and tab, four-arrow cursor control, and delete key; data files compatible with *II.* Apple, 20525 Mariani Ave., Cupertino, CA 95014. *II,* $150; *IIe,* $195.

Bank Street Writer. Kusmiak, Bank Street College of Education. Designed for use by whole family. Universal search and replace, word wrap are standard. U/lc without hardware. On-disk tutorial. Takes advantage of memory, keyboard on IIe, if you have one. Broderbund, 17 Paul Dr., San Rafael, CA 94903. $69.95. *2/83.*

Cut and Paste. Designed for simplicity. Features include scrolling menus, automatic word wrap, block indenting, page formats, page numbering. Electronic Arts, 2755 Campus Dr., San Mateo, CA 94403. $50. *2/84.*

Format-II, Enhanced Version. Hardwick, Beckmann. Word processor supports all popular 80-column cards, stores up to 50 pages of text on one disk. Includes single keystroke editor, mailing list database; displays text on-screen exactly as it will print out. Compatible with hard disk drives. Kensington Microware, 919 3rd Ave., New York, NY 10022. $150.

HomeWord. TC Computer Systems. Icon-operated, displays print-formatted document on-screen, mixes bold, underlined, or regular type. Tiny window displays page format. Automatic outline formatting. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $49.95. *12/83.*

Lexicheck IIe. Spell-checking companion to *Word Juggler IIe* has 50,000-word vocabulary, room for auxiliary personal dictionary, features global replacement of misspelled words. Quark, 2525 W. Evans Ave., #220, Denver, CO 80219. $129. Requires *Word Juggler IIe,* 128K. *10/83.*

Magic Window II. Forty, 70 (in hi-res), or 80 columns in this expanded version. With user-tailored, fast menu; underlining; global search and replace. IIe version uses all 64K. Artsci, 5547 Satsuma Ave., North Hollywood, CA 91601. $149.95.

MegaSpell. Good news for users of *MegaWriter. MegaSpell* is an easy-to-use spell checker with a 40,000-word dictionary with room for 10,000 more. Imperfect dictionary, difficult to use without two drives. $59.95. *1/84.*

MegaWriter. Gives 80-column page without 80-column card, prints in boldface, underlines via menu; features mail list merge, find, replace, text block move. Reads Pascal and DOS files. Written in Pascal. Requires 64K. Megahaus, 5703 Oberlin Dr., San Diego, CA 92121. $99.95. *8/83.*

PFS:Write. Edwards, Crain, Leu. Interfaces with other PFS programs. Includes search and replace, moving and duplicating of text blocks, help screens. Document appears on-screen as it will look when printed—including page breaks, underlining, boldfacing. Software Publishing, 1901 Landings Dr., Mountain View, CA 94043. $125. *12/83.*

ScreenWriter II. Kidwell, Schmoyer. No extra hardware for u/lc, 70-column display, printer spooling. Edits Basic, text, and binary files; complete search and replace. Sierra On-Line, Sierra On-Line Building, Coarsegold, CA 93614. $129.95. *1/83.*

• **Sensible Speller.** Hartley. Spell-checking program sports listable 85,000 words, extensible up to 110,000 words. Recognizes contractions, gives word counts, word incidence, number of unique words. Clear documentation and simplicity of operation. Works with many word processors' files. Best of breed. Sensible, 6619 Perham Dr., W. Bloomfield, MI 48033. $125. *11/82.*

✓ **State of the Art Word Processing.** Password-protected, menu-driven, integrates with State of the Art's accounting programs. Boldfacing and underlining. Insert data from accounting packages into documents. State of the Art, 3183 Airway Ave., Costa Mesa, CA 92626. $395.

Word Handler II. Elekman. Simple program with straightforward documentation. Eighty-column printing with the IIe. Silicon Valley Systems, 1625 El Camino Real, #4, Belmont, CA 94002. $199. *11/82.*

Word Juggler IIe. Gill. Sophisticated word processor with search, replace, and block move. Printout can be viewed on-screen prior to printing; multiple copies printed of selected pages. Quark, 2525 W. Evans Ave., #220, Denver, CO 80219. $239. *10/83.*

WordStar. Screen-oriented, integrated word processing system in CP/M. Z-80. MicroPro, 33 San Pablo Ave., San Rafael, CA 94903. $495.

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"Applesoft BASIC for the Apple II/IIe"
by Lois Graff, Larry Joel Goldstein

This is a practical guide to Applesoft BASIC which makes learning easy, even for those without programming experience. Most of the applications programs can be easily applied to specific personal and professional needs.
1983/320pp/paper/ISBN 0-89303-320-0/
D3200-5/$17.95

"Apple Graphics: Activities Handbook"
by Harold J. Bailey, J. Edward Kerlin

Here's a "hands on" approach to learning both low and high resolution graphics for the Apple. Step-by-step, users will learn by doing. The graphics novice and the more sophisticated graphics user will find just the right activities to maximize the graphics capabilities of the Apple II and IIe.
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"Programming the Apple II and IIe; A Structured Approach, Revised and Enlarged"
by John L. Campbell, Lance Zimmerman

This is the guide that will take you down the right path to programming your Apple in BASIC. The approach presents the BASIC language as a problem-solving tool, which gives you quick, easy, and useful results. It shows how to more effectively write programs starting simply then proceeding to more complex ideas.
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Make your selection for your Apple II or IIe from the Pick of the Crop at B. Dalton Booksellers, Waldens, Crown Books, and other fine bookstores and computer dealers nationwide. Or call, 800-638-0220 for information. The Brady Co. is a Prentice-Hall Company, located in Bowie, MD 20715.

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ble with *PIE Writer*. Hayden Software, 600 Suffolk St., Lowell, MA 01853.

Apple III

Access III. Communications program for timesharing and standalone tasks; gives access to remote information services, minis, and mainframes. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $150.

Apple Business Basic. High-level structured programming language. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $125.

Apple Speller III. Sensible Software. Spell-checking program based on the Random House Dictionary recognizes 81,400 words including geographic terms, names, abbreviations, figures. Gives word counts, word incidence; works with most Apple III word processors. Directly accessible from *Apple Writer III*, version 2.0. Apple Computer, 20525 Mariani Ave., Cupertino, CA 95014. $175.

Apple III Business Graphics. BPS. General-purpose graphics program draws line graphs, bar graphs in three formats, overlays, and pie charts in 16 colors. Continuous or discrete data; curve-fitting capabilities. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $175.

Apple III Pascal. Program preparer with editor, compiler, disassembler, linker, filer, system library. Features cursor control, text modeling, formatting. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $250.

Apple Writer III. Lutus. Uses WPL (word processing language) to automate text manipulation and document creation. Adjusts print format during printing; translates from typewriter shorthand to English or other language and back again. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $225.

BPI General Accounting. BPI Systems. Includes *General Ledger, Accounts Receivable, Accounts Payable,* and *Payroll*. Maintains customer, employee, and vendor files; prints customer statements, checks. Analyzes budget, compares historic information, keeps independent financial records for 99 different departments and locations. Provides password protection for each company, can be maintained on one disk. Requires 256K Apple III, ProFile hard disk. Apple Computer, 20525 Mariani Ave., Cupertineo, CA 95014. $495.

Catalyst. Allows boot from hard disk; transfers all programs to ProFile. Quark, 2525 W. Evans Ave., #220, Denver, CO 80219. $149.

Hardisk Accounting Series, 2.0. General ledger, accounts receivable, and accounts payable handle 32,776 customers or accounts; inventory features five methods of evaluation. Also payroll, management analysis, and mailing labels. Great Plains, 1701 S.W. 38th St., Fargo, ND 58102. $395 to $595 per module.

Inkwell. Wunderlich. Word processor prints documents as they appear on-screen, simulates typewriter or creates form letters from mailing list. Horizontal scrolling allows text up to 155 characters wide. Foxware Products, 2506 W. Midwest Dr., Taylorsville, UT 84118. $185.

Keystroke. Handles large amounts of data. Can hold up to 32,000 records on hard disk and provide instant access. User definable keys. Access two files at once, or join two files. Report generator saves up to eight report formats. Easily merges with *VisiCalc*, *Apple Writer*, and *Word Juggler*. Brock, Box 799, 8603 Pyott Rd., Crystal Lake, IL 60014. Database, $249. Report generator, $149.

Lexicheck. Spelling checker that runs from inside *Word Juggler*. Fifty-thousand-word dictionary; add your own words. Eight-thousand-word legal dictionary disk also available. Quark, 2525 W. Evans Ave., #220, Denver, CO 80219. $145.

Mail List Manager. Generates, stores, sorts, edits, and prints mailing list files. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $150.

Micro/Terminal. Gives access to any in-house or remote database; set up and log only once. Built-in editor or edit off-line. Microcom, 1400-A Providence Hwy., Norwood, MA 02062. $99.95.

PFS:File. Page. Form-oriented information-management system stores and retrieves up to 32,000 entries. Software Publishing, 1901 Landings Dr., Mountain View, CA 94043. $175.

PFS:Graph. Chin, Hill. Works alone or interfaces with *PFS* databases and *VisiCalc* files. Produces bar, line, and pie charts, merging data from several sources. Software Publishing, 1901 Landings Dr., Mountain View, CA 94043. $175.

PFS:Report. Page. Generates reports; sorts, calculates, and manipulates data filed with *PFS:File*. Software Publishing, 1901 Landings Dr., Mountain View, CA 94043. $125.

Quick File III. Personal index card or filing system that generates reports, sorts. Fifteen fields; file as long as disk allows; can be put on ProFile. Apple, 20525 Mariani Ave., Cupertino, CA 95014. $100.

State of the Art General Ledger and **Business Modules.** Standalone interfaceable modules for 12 accounting periods. *General Ledger* can handle 470 accounts, 100 transactions before updating files. Modules for budget and financial reporting, accounts receivable/payable, inventory control, sales invoicing, payroll, professional time and billing. State of the Art, 3183A Airway Ave., Costa Mesa, CA 92626. *General Ledger, Accounts Receivable, Accounts Payable, Payroll, Inventory Control*, $595; *Sales Invoicing, Budget and Financial Reporting*, $495; *Professional Time and Billing*, $795.

Stock Portfolio System. Tracks investments, generates reports on current portfolio status, profit and loss statements, individual security status, dividend and interest income, expenses. Stores quotes for historical recall, calculates return on investments before and after tax, provides notice of stocks going long-term, dividends coming due, options expiring. Smith Micro Software, Box 604, Sunset Beach, CA 90742. $185.

VersaForm. Landau. State-of-the-art business-forms processor. Does invoicing, purchasing orders, mailing lists, client billing. Powerful, complex, worth getting to know. Hard-disk-compatible. Applied Software Technology, 14128 Capri Dr., Los Gatos, CA 95030. $495. *8/82*.

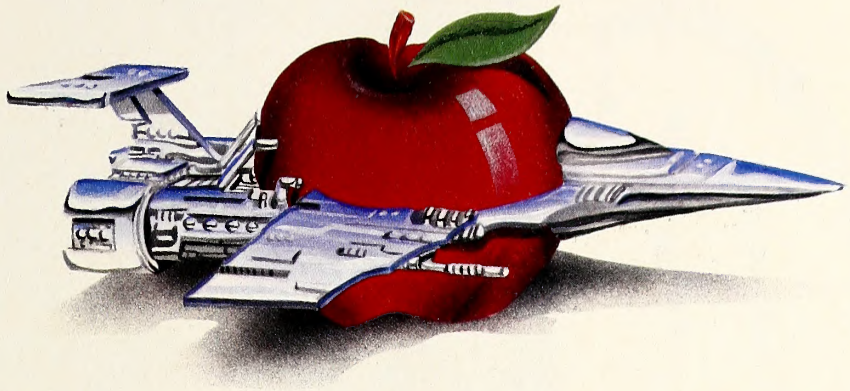
VisiCalc:Advanced Version. Bricklin, Frankston/Software Arts. For corporatewide modeling applications; develop sophisticated templates to be filled in by novice users. On-screen help, IRR and calendar functions, macro facility, variable column widths, locked cell values, and hidden cell contents. VisiCorp, 2895 Zanker Rd., San Jose, CA 95134. $400.

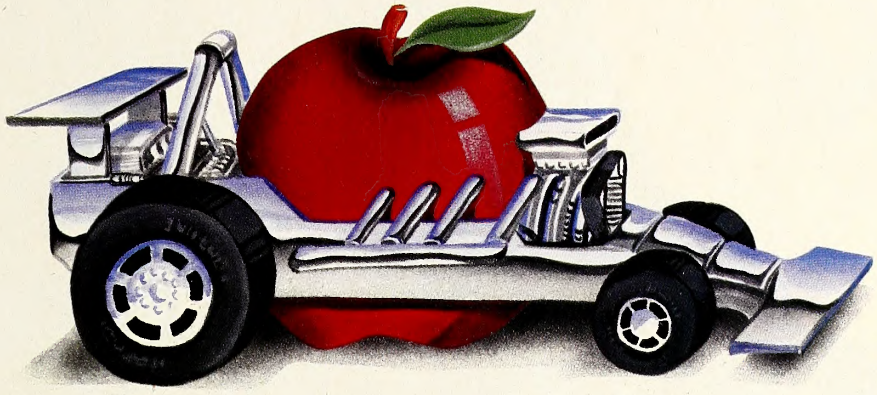
VisiCalc III. Software Arts, Bricklin, Frankston. Just like it sounds; expanded memory, u/lc, 80 columns. Four-way cursor movement. VisiCorp, 2895 Zanker Rd., San Jose, CA 95134. $250.

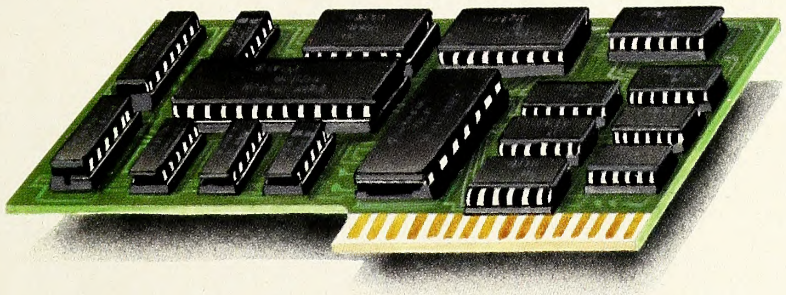
VisiSchedule. Critical path PERT scheduler. VisiCorp, 2895 Zanker Rd., San Jose, CA 95134. $300.

Word Juggler. Gill. Word processor uses expanded memory. Printout can be viewed on-screen prior to printing; multiple copies printed of selected pages. Quark, 2525 W. Evans Ave., #220, Denver, CO 80219. $295. *12/82*. ❑■

Three ways to Speed up your Apple II & Apple IIe for $295







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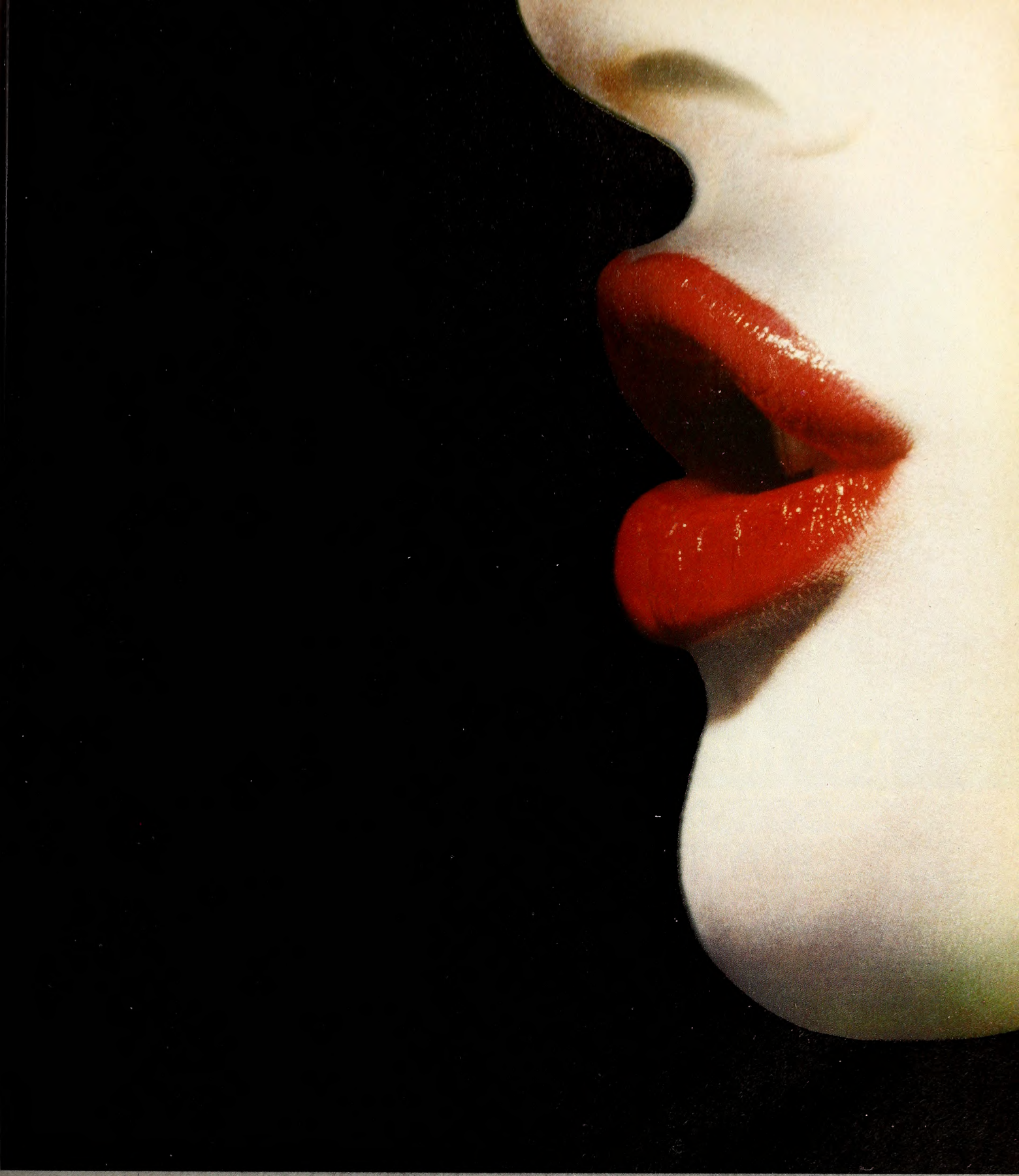

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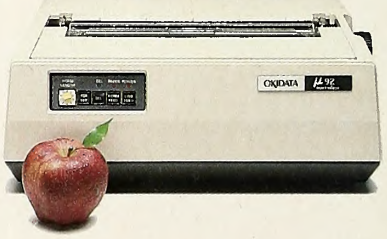

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OPEN DISCUSSION

Open Discussion gives you the chance to air your views and concerns, to seek answers to questions, to offer solutions or helpful suggestions, and to develop a rapport with other readers. It's what you make it, so share your thoughts, typed or printed, and double-spaced (please), in Softalk*'s Open Discussion, Box 7039, North Hollywood, CA 91605. To ensure the inclusion of as many contributions as psosible, letters may be condensed and edited.*

One in Five

I purchased Advanced Logic Systems's Smarterm II eighty-column board about seven months ago to use with *Apple Writer II*. Unfortunately, I was unable to use the board immediately due to a software problem. After contacting ALS about my problem, they immediately sent me a preboot disk that arrived within the week and worked as advertised.

Recently I decided to change my word processor to *Magic Window II*, as it was advertised to work with many eighty-column boards, including the Smarterm II, and had many of the features that I was looking for at the time. Much to my dismay, I was unable to boot the program in the eighty-column mode. Not wanting to give up *Magic Window II* completely, I resigned myself to using it in the seventy-column mode.

Remembering my good experience with Advanced Logic Systems in the past, I decided to give those folks a call to see if they could help me. (My attempts to discuss the problem with Artsci led nowhere.) I was pleasantly surprised when the technician on the phone was immediately able to tell me what the problem was. Apparently the ROM on the old ALS Smarterm II was unable to work with the *Magic Window II* software. I was told a new ROM would correct the problem. I prepared myself for the worst and asked what it would cost. "No charge" was the reply. Sure enough, three days after my conversation I was using the program in the eighty-column mode.

I hope this is the direction that all software companies are taking. For every letter like this, I could write five noting the bad experiences I have had in attempts to obtain help from various companies. To Advanced Logic Systems, I say: Well done!

Roosevelt Watson, Las Vegas, NV

Killer Assembler Updated

Six months ago, I purchased *ORCA/M*, the 6502 assembler from Hayden Software. I expected, as advertised, a high-quality tool for producing efficient machine language programs. That is exactly what I received, and I have been very satisfied with *ORCA* ever since. I couldn't have asked for more, but I got more. I recently received an upgrade kit from Hayden, updating my 3.4 release to the new *ORCA/M* 3.5. The new release incorporates all of the features of the new 65C02 processor, an eighty-column driver for the IIe, and fixes for bugs found in release 3.4. The package also includes all necessary updates to the reference manual, three technical bulletins, and a newsletter. In addition, Hayden made available to *ORCA* users a special offer for 65C02 processor chips.

I have seen a lot of letters in this column about Apple owners who have requested and received exceptional service, but never have I heard of such service being received spontaneously, without a maintenance contract or any action on the part of the user. I've been a systems programmer on a large IBM mainframe for a long time, and this is better service than I have ever seen from any software vendor (including IBM, which is famous for service). I hope that Hayden Software sets an example that many others will follow. They've made a lifelong customer out of me.

Ron Richardson, Syracuse, NY

Hear Him Chuckle

Softalk's listing of bestselling software is interesting and well-intentioned. However, it tallies only software sold through Apple dealers, and in this regard may be misleading. I purchased the *Circascript* software from Circadian Software in answer to an advertisement in the magazine. Since it was not on the Bestsellers list, I felt I might obtain an inferior product.

On the contrary, I use this software every day for wills, business agreements, letters, billings, and office schedules. With all that I do with *Circascript*, I can't think of anyone who could put it through a greater test. It has served me very well. I chuckle each time I read *Softalk*, thinking that my competition is purchasing the other software. I pat myself on the back for taking the time to shop around for mine.

Readers should be put on notice that the Bestsellers list does not include software sold directly by the manufacturer.

Robert P. Gasparro, Philadelphia, PA

More Fun in the Graphics World

MasterChart, by Spectral Graphics Software, is one of the best values I have found in more than two dozen software purchases during the past year. The program allows the user to make two- or three-dimensional bar or pie graphs and contains a module for generating line graphs as well. Best of all, it has a graphics processor that permits the user to customize graphs and charts by printing or drawing on them with point-by-point control. Considering the fact that the graphics processor can also be used to create shape tables and construct graphic scenes on a blank screen for dumping to a printer, the very reasonable price is amazing in a market of super-inflated prices. Hats off to Spectral Graphics for an exceptional software value!

William Ickes, Arlington, VA

Not Altogether Lost in the Flood

The November *Softalk* contains a letter from Robert L. Stein reporting problems with his Vista V1200 disk drive. Mr. Stein's letter suggests that the laudatory review of the Vista V1200 that appeared earlier in *Softalk* was in fact misleading. My experience with the Vista V1200 is in conformity with that of the reviewer and does not agree with the experience of Stein.

I have been using a Vista V1200 for more than six months and have been extremely satisfied with its performance. I have had some difficulty when the relative humidity reached above the 80 percent level, recommended in the Vista manual as the maximum level of relative humidity in which the machine should be used. This is the only trouble that I have had, and it's offset by the tremendous advantages offered in the replaceability of the cartridges. My principal reason for writing this letter is the responsiveness that I have had in dealing with the Vista Computer Company. It has been extremely helpful in dealing with my inquiries. It is important for this kind of word-of-mouth advertising to be circulated among users who have been almost totally deserted by dealers, at least in terms of support, and who face a constant flood of misleading advertising.

Leroy O. Stone, London, Ontario, Canada

No, We Don't Think You're a Printer Pirate

I recently received a used Okidata U82A printer as a gift. Unfortunately, as with most used equipment, the manual was not included. I wrote a letter to the consumer products division at Okidata, knowing they would probably toss it aside. Much to my surprise, I received a new manual in less than two weeks. Incidentally, the manual is very well written and the product performs very well.

Mike Heppler, Oxnard, CA

All Spelled Out

I would like to thank *Softalk* for the review (January 1984) of *MegaSpell*, the spelling checker companion to *MegaWriter* for the Apple II and IIe, published by Megahaus. As the reviewer, Matthew Yuen, correctly points out, *MegaSpell* is indeed trivially easy to use and is an excellent companion to *MegaWriter*. He even goes so far as to say that our manual is not needed. A compliment indeed, although not entirely justified. If the reviewer had taken the time to read our manual, he might have avoided making a number of factual errors in his review.

It was erroneously reported that "*MegaSpell* is nearly impossible" to use with one disk drive. This is wrong. *MegaSpell* works very well with one disk drive, with very little disk swapping, provided that the user follows the instructions given on page 26 of our manual.

Yuen also concludes—from our advertising—that we claim that *MegaSpell* can spell the word supercalifragilisticexpialidocious and that we then misspell it as supercalifrag*on*isticexpialidocious in the program. Wrong, Mr. Yuen! Walt Disney Productions owns the word supercalifragilisticexpialidocious (from *Mary Poppins*, if you recall). The word we use is of our own invention, though admittedly similar to the Disney word, and our invented word appears both in our ad and in our dictionary. This is a trivial error on Yuen's part, but a possible indication of how thorough he is as a reviewer.

Finally, I noticed that Yuen takes a few passing potshots at *MegaWriter*. It makes me wonder why he did not make the same criticisms when he reviewed *MegaWriter* back in August and concluded that "this is a rather good program; the pluses are strong, the minuses are small." Since then we have intro-

duced an even better version of *MegaWriter* for the Apple that reads both Apple DOS and Pascal text files, boots in less than twenty seconds, works effortlessly with one or two disk drives, and automatically configures itself to make full use of either the Apple II or IIe keyboard without any intervention by the user.

I appreciate the many positive and accurate remarks he made about *MegaSpell*. I hope this will set straight the few factual errors that were made.

Paul R. Stannard, president, Megahaus, San Diego, CA

Disney also owns Mary Poppins. *And we spell it that way, too.*

Taking His Reactions to Heart

As president of Datamost, publisher of *The Market Technician*, I feel that I must comment on the overly harsh and unjustified review of our program that appeared in Buttonwood Apples (November *Softalk*).

Ken Landis felt that the program "did not work" because data for individual stocks that he entered could not be graphed. If Landis had acted like a normal purchaser and called us, he would have found that his early version of the program did experience some problems and he would have immediately received a revised version at no cost. I must emphasize that the program can and does graph individual stock data, including all programs distributed since the early summer of 1983.

Landis also has problems with the fact that data on the five-year database must be compiled before use. *The Market Technician* is both a stock market database and an analysis program, and it is quite common in a database program to have to set up the search criteria manually before searching the database. Since the powerful search feature does present the user with many options, we felt that a separate compiler section was the most efficient and useful manner in which to approach the task. Moreover, Mr. Landis neglected to mention that in this compiler module there is an automatic feature that permits the stock market indexes to be compiled from the database automatically. Also, since each individual stock data file contains only 120 days of data (which can be graphed and thus easily viewed), we felt it totally unnecessary to modify the database search function to operate on the stock files.

Landis complains that the program does not make the most effective use of a two-drive system, as certain data files must be on the disk in drive one. For the most part, this decision was made to minimize the disk swapping that would occur in drive two if certain data files were not stored on the disk in drive one. It is also beneficial to those many users who may not have two disk drive systems. Moreover, the fact that the program is not protected permits use of the program disk for storage, as there is no chance of destroying or damaging an irreplaceable disk.

Landis also complains about a lack of error checking of the Dow Jones data the program receives from the Dow Jones News/Retrieval Service. We feel that it is impossible to perform a complete check, as there is no way for the program to know whether the price of a stock is really $57.00 (when it should have been $58.00) if a transmission problem caused the error. These errors can only be found by the user and are often obvious when the stock data is graphed.

Most of Landis's other comments (such as the fact that he thought the menu was distracting, or there should have been numbers next to the menu choices) are, we believe, minor and express a single user's preference as to how a program should be designed. A number of his other comments are constructive and, as suggested, will be taken to heart.

Overall, however, I feel that the current version of *The Market Technician* offers more for less than other similar programs on the market. It is being used by many satisfied customers and did not deserve the treatment afforded it by Ken Landis.

David Gordon, president, Datamost, Chatsworth, CA

Starfire Wars

On October 19, I ordered *Casino Master* from Starfire Games, a division of Omnisoft Corporation. Enclosed with the order was my check in the amount of $37.22. This order was in response to an advertisement in the October *Softalk*.

Since that date, my check has been cashed and returned with my bank statement. I have requested, by mail, that Starfire Games fill my order or refund my money. I have had no response.

Wayne L. Strickler, Pleasanton, CA

On October 8, I sent a money order in the amount of $34.95 to Starfire Games for the game *Global Thermonuclear War*. I have not received the game, nor has the company responded to my inquiry as to the cause of the delay. I inquired at my bank and discovered that the company cashed the money order in November. Since the company advertised in your magazine, I assumed it was a reputable one. Now, however, I have doubts. I also believe that I must not be the only one to have had a problem with Starfire Games.

Mrs. Eugene Kretkowski, Bayonne, NJ

No Nukes Please

I was appalled to see the advertisement on page 353 of the December *Softalk*. The full-page color ad describes a "game" of global thermonuclear war, with "full color graphics, exciting animation, and realistic sound effects. . . . You watch enemy strikes against your homeland and the casualties grow to staggering proportions. . . ."

Our country is struggling with the nightmare of a nuclear war that is all too possible. For anyone who has given this topic a moment of serious thought, it is not a subject to treat in a trivial and flippant way. It is even more obscene for a company to capitalize on the threat of nuclear war. While the children of this generation are plagued with emotional problems stemming from fears for their future, Starfire Games tries to make a fast buck.

Has the computer business become so obsessed with profit in its swelling market that it has forgotten all constraint and social conscience?

Rebecca Field, The Union of Concerned Scientists, Cambridge, MA

No Loco Motive for Training

As a regional sales manager, I travel widely. As a computer user, I visit many computer stores in the eastern half of the country. Recently I became interested in getting a spelling correction program to use with *Apple Writer IIe*. I had no idea how dictionary programs worked and no idea what was available for my Apple IIe. After two months of travels and visits to seven computer stores, all that I know about such programs I've found in magazines and not in computer stores.

In Minneapolis, Minnesota, a young fellow allegedly called his Apple distributor because he was unsure what might be available to run on the IIe. He reported that Apple was planning to introduce such a program this fall, but he could not help me immediately.

In Charlotte, North Carolina, I visited four shops. The first, an Apple dealer, was totally unaware of any spelling checker program for the Apple. The second, a software-only shop, had nothing for the Apple at the time but told me Sierra On-Line would be bringing out just the thing, called *The Dictionary*. However, a December 1982 computer magazine reported that Sierra On-Line had a program called *The Dictionary* available then. This is a new program? In the third shop, again an Apple dealer, a young woman was totally unprepared to demonstrate the program. She told me that it would be best if I sat down and took a couple of hours

to read through the documentation. I compared this to buying a car by reading the folder at the dealership without looking at or riding in the car; she failed to grasp the meaning of my comparison. At the last shop I tried in Charlotte, again an Apple dealership, they were not aware of any such program. Did I want a dictionary program or a spelling checker? I didn't know there was a difference, so I couldn't tell them what I wanted. If I couldn't tell them what I wanted, how did I expect them to help me? Could I perhaps come back when I knew what I wanted?

Back in Columbus, Ohio, it has been much the same. A young saleswoman could not get *Sensible Speller* to boot. She was trying to boot the dictionary disk instead of the program disk! Even after we corrected that, the program still would not boot. She decided that the IIe we were using had too many cards in it. I left. In another shop, the young lady assigned to me by the sales manager was unable to get the program *Sensible Speller* up and running, but I felt she showed promise. I can identify with a salesperson who says, "I don't know, but I will find out and report back." A week later I called to make an appointment with her. I was told she was in class and couldn't be disturbed for a customer. She may have a good attitude, but her employer certainly doesn't!

I have been in sales for eighteen years. Perhaps I am too demanding, but I find it hard to deal with salespeople who are totally uninformed about a product. The wisest thing any computer company could do to increase sales would be to implement a salesmanship training course for its dealers and their people.
Winston Sayers, Columbus, OH

Us versus Them
With the increasing polarization between the U.S.S.R. and the U.S., perhaps a nonmilitary way of intimidating the Soviet government should be attempted. If micros could be sold internationally to heavily populated countries, such as China and India, maybe we could intimidate the U.S.S.R. through sheer knowledge. Some of the finest minds may as yet be unexposed to the microcomputer. These potential programmers could provide us with a viable attempt at promoting the free enterprise system. The Third World could well determine the future of capitalism versus socialism.

If we can put Apples into homes in socialist China, there could be a potential market never realized before. Both India and China are located in strategic areas that could prove truly beneficial to our position. Certainly the ideas of Karl Marx were developed years before the computer age. The workers now are more white-collar than Marx ever envisioned. The computer revolution would then have a totally different meaning.

Apple can blow away IBM in the home computer market if the company would only become involved with educating the less fortunate people all over the world. But then, maybe not.
Frank Stokes, Miami, FL

Eight Good Slots
I read with great interest the interview with Steve Wozniak in the December Marketalk News column. I have an Apple II Plus, so his comments struck a keen note for me. Descriptions of the upcoming Macintosh had piqued my current microcomputer art interests until I read that article. A IIe upgrade plug-in board, twenty-four-bit addressing, and sixteen megabytes of memory for the II Plus would certainly be a boon to us "pioneers." Today's marketing philosophy on micros seems to be the same one used for cars in the fifties and sixties (that is, buy a new one every two or three years).

I certainly agree with Woz's philosophy. After all, the reason I bought an Apple computer three years ago was so I could fill up those eight slots as my knowledge and interests grew. I hope (fingers crossed) that corporate Apple listens to Woz so that the things discussed in your article do come to fruition.
Gregory W. Lum, San Francisco, CA

A Tree Grows in Microcomputerdom
Thanks for running "City Trees—Apples Make a Case for Urban Forestry" (August *Softalk*). We have since sent our forestry software to more than two dozen people located all over the United States and Canada, and as far away as Australia. Encouraged by this success, I am currently at work improving the model for a future release. I hope that our collaboration has inspired others to put their Apples to work for environmental causes. I also want to thank Dennis Briskin, author of the article and a good friend, for showing us that with words in print, one can reach across the globe. One difficulty we have had is that not all of our users have the Pascal system, and the boot disk is required to use our programs, as they are written in Pascal. If anyone has software that converts p-code into machine code usable by Basic, I would appreciate hearing from you through Open Discussion.
Jeff Hook, Magic Incorporated, Stanford, CA

Bugabooboo
"Boxing the Bugaboos" by Bill Parker (December *Softalk*) treats a subject of great interest to me as the owner of an Epson MX-80. I even paid excessively for that supposed new printer manual, *MX Printer Manual with Graftrax*. I feel that "Boxing the Bugaboos" suffers from the same lack of specific information that too often characterizes such articles and many manuals.

It fails to state which Epson models the author is writing about or which model of Apple it refers to. It does not mention the fact that the Basic listing makes no attempt to print lowercase letters. It doesn't work for my MX-80; it won't even turn on emphasized mode as written. (I know my printer doesn't have italics.)

By the time I got through, I had to run one of my programs that does work to convince myself the printer was still working.
Joseph Fulford, Pacific, CA

East of Eden
The product advertised on page 142 of the January issue is smut. If that is what you intend to advertise and/or sell in *Softalk*, then you can stick it up your nose. There is no way I will recommend your magazine to any of my students.
James W. Dean, Appleton, WI

Epson Down Under Confusion

I'm confused. I just read the article on the Epson (October *Softalk*) and have just discovered that my Epson MX-80 Type II printer doesn't exist. Or maybe it does, but America hasn't discovered it.

You see, my MX-80 (quite standard, I assure you, with no hardware modifications) can print characters in normal, emphasis (which can be locked on), expanded, condensed, and double-strike type (not in the Type II manual). Programmable form feed, horizontal tabbing, line spacing and right margin, MSB control (with the help of a machine-code routine in the Epson 8132 interface manual), foreign alphabet symbols, home-printhead, delete-type backspacing, skip-over perforation control, and hires screen dumps and "line" graphics are all standard.

It does not have italics, block graphics, superscripting or subscripting, underlining, or unidirectional printing. I'm not sure whether it has redefinable escape codes or not.

Is my printer a "standard" model? If not, how can I upgrade (or downgrade) it to a standard model? Here in Australia, when they were still selling MX-80s there was never such a thing as a Graftrax chip. Our Aussie versions were either Type II or not.

Ian Chia, Melbourne, Victoria, Australia

False Advertising

In regard to Marketalk Reviews: Please don't put the picture of a software package in the column's masthead and then not include it in the reviews! I looked through the December reviews five times trying to find *Dollars and Sense*! I'd like to see a one-page recap of the products reviewed each month at the end of the column like Jerry Pournelle's User Column in *Byte*. This would be easy to photocopy and keep in a reference file. In addition, although I know the descriptions in Fastalk give the month that a product is reviewed, I would also like to see a page number. Many reviews appear in articles rather than in the review section.

Bill Budge's Graphics Page is great, and I love Open Discussion. In all the magazines I read, the latter is one of my favorite columns.

Steve Knouse, Houston, TX

Sophie Speaks about Style

Softalk's Hobby 10 Bestseller category should be renamed Utility 10. Here is a comprehensive list of reasons:

1. Every product ever featured in this list has been a utility disk, not a hobby disk. (For example: Apple Pascal, *GPLE*, *Double-Take*, *Graphics Magician*. . . .)

Bert Kersey, president, Beagle Bros

Hobbling Hobbyist

In response to David V. Luzi (October Open Discussion): I too was once very curious about the ASCII character codes listed in the *Apple Reference Manual*. It wasn't too many years ago (before 1974) when I first built my own computer. Back then, we were known as computer hobbyists, because nobody took us seriously. And indeed, why should you be taken seriously when your money and time were all wrapped up in what looked like a 1940 version of a crystal radio set? Well, like those earlier radios that brought us into the world of the fifty-dollar stereo, so the earlier computers made way for today's personal computers. It was hobbyists that started Apple and other personal computer companies.

We hobbyists had to create or borrow hardware and software from existing systems and make them work. (If you want some real good reading, try some of the pre-1977 computing magazines; you'd be surprised at the equipment and software problems we had to deal with.) One of the key problems was inputting the programs. Most of us used toggle switches and loaded everything, and I mean *everything*, into memory one byte at a time (that includes the operating system, since PROMs were too expensive then). Hobbyists with some capital had the chance to interface TTY terminals to their systems. Sure, they still had to toggle in the operating system and have the smarts to interface the TTY, but after that they worked great. Maybe that's why the fanciest game program around was Ping-Pong. At any rate, the character codes established for those communication terminals are still used in today's keyboard codes. These character codes were established as a standard by the American National Standards Institute (ANSI), which gives the complete definition of each character code used.

To save readers money and postage, I'll try to cover those character codes that are applicable to the Apple. Understand that even though these character codes are standardized, it does not mean that they must be used as defined. They were written to be used for information interchange among processing systems over communication equipment. Therefore, the codes reflect this type of communication and not that of keyboard to CPU. This is true not only for Apple, but for every other make of personal computer. Only those codes that are used by a computer company are conformed to; all others are modified as needed. Though the codes stay, don't assume the meaning; look them up.

In the accompanying chart, I've listed the character code mnemonic, the ASCII definition, character code representative (hex), and the *Apple Reference Manual* definition. A blank in the place of the reference manual definition means that the character code is not supported by Apple IIs. Also note that not all of the manual's definitions agree with the ASCII definitions. (By the way, character code "em" has a lot of potential usage, so look at this one closely.)

Good information sources are user groups; some companies are large enough to have one, or need one. My user group meets during the lunch hour, and we have done a lot even without

Character Code Mnemonic	ASCII Definition	Character Code Representative (Hex)	Apple Reference Manual Definition
ACK	acknowledge	06	
BEL	bell	07	buzzer command, p. 30
BS	backspace	08	backspace command, p. 34
CAN	cancel	18	cancel command, p. 33
CR	carriage return	0D	return command
DC1	device control 1	11	
DC2	device control 2	12	
DC3	device control 3	13	stop.list feature, p. 30
DC4	device control 4	14	
DEL	delete/rub out	7F	
DLE	data link escape	10	printer command, p. 54
EM	end of medium	19	user command, p. 58
ENQ	enquiry	05	examine command, p. 53
EOT	end of transmission	04	
ESC	escape	1B	escape mode, p. 34
ETB	end of transmission block	17	
ETX	end of text	03	no reset, to Basic, p. 54
FF	form feed	0C	
FS	file separator	1C	
GS	group separator	1D	
HT	horizontal tabulation	09	
LF	line feed	0A	line feed command, p. 30
NAK	negative acknowledge	15	retype command, p. 34
NUL	null	00	
RS	record separator	1E	
SI	shift in	0F	
SO	shift out	0E	
SOH	start of heading	01	
STX	start of text	02	reset, back to Basic, p. 54
SUB	substitute	1A	
SYN	synchronous idle	16	
US	unit separator	1F	
VT	vertical tabulation	0B	keyboard command, p. 55

Character Code Definition Chart

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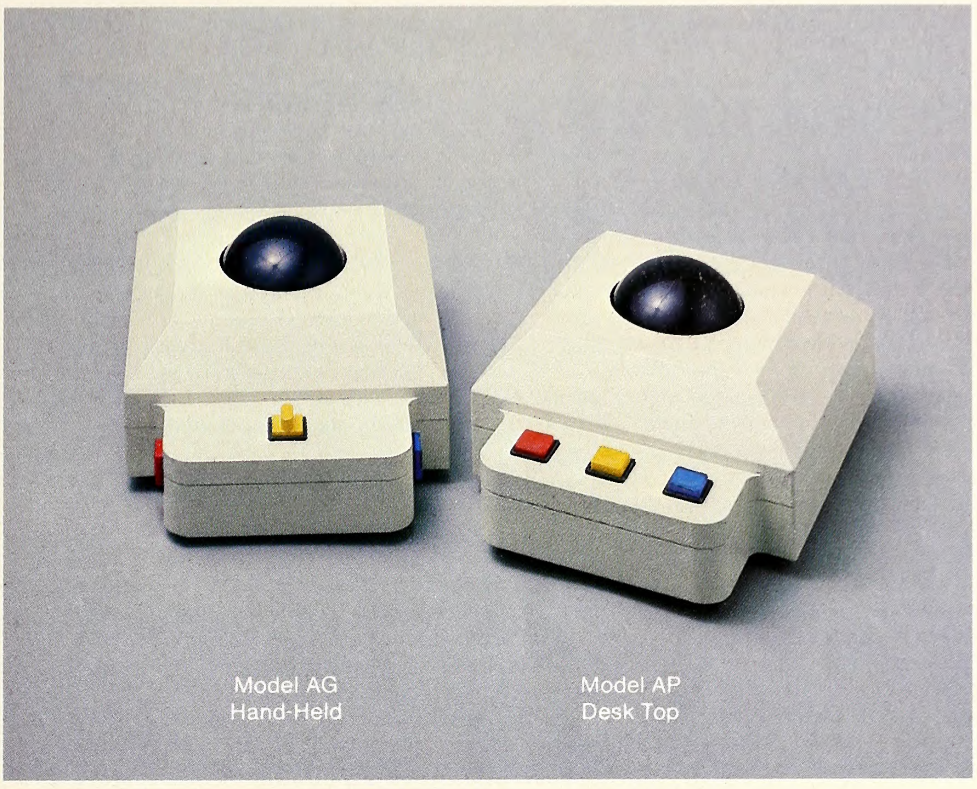

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the group owning an Apple. We're known as the Litton Apple User's Group (LAUG), and we welcome all Litton employees to join us and get our bimonthly newsletter. It's also a great place to exchange and load up on public domain programs.
David T. Carrott, Woodland Hills, CA

Hello Mudder, Hello Fadder
In reference to an inquiry in Open Discussion about computer camps: Computer Solutions, an Apple dealer, and Kickapoo Kamp, a recreational camp in the Texas hill country, have joined together to offer two one-week computer training/recreational activity camps this summer. The camp is for kids ages ten to sixteen and will feature thirty hours of Apple computer instruction, as well as outdoor activities like horseback riding, swimming, tennis, boating, and archery. Sessions will be held July 29 through August 5, and August 5–12. Computer instruction will include both beginning and advanced levels. Classes will range from literacy to advanced Basic programming, including graphics and games.
Kathy Musgrave, San Antonio, TX

Life-Tech Ventures, a nonprofit program, offers a computer camp on the Clark University campus in Worcester, Massachusetts. There are six one-week sessions for campers ten to thirteen years old. Activities include robotics, theater, art, and others. Students are introduced to Basic, Logo, graphics software, and word processing. Outdoors, special emphasis is given to cooperative as well as competitive game playing, swimming, basketball, and tennis.
John G. Santos, Southbridge, MA

Alaskan Trader
To respond to Kim McCartney (November Open Discussion): I have been trading commodities for over two years using an Apple. I'm trading programs I have developed, along with data acquisition and management routines that have evolved from some commercial software that is no longer available—but didn't work well as supplied anyway. Most of the software I've bought hasn't worked. I've been able to write what I want, as I have extensive prior experience in this area. A routine to plot commodity prices with moving averages is included in the *Quicktrieve* system supplied by Commodity Systems (Boca Raton, FL). The package also includes data acquisition software and is a part of their data sales effort. I have recently used this software and found it to be functional and bug free.
Jere Murray, Seldovia, AK

Logo in Print
In response to Roy Freborg's dilemma of printing Logo without a graphics card (January 1984 Open Discussion), I can offer a solution. After loading Logo, load the procedure you wish to print and call it to the screen. Then remove your file disk, insert *Printographer*, and give the command *.printer 6. Printographer* will boot, but you will not lose the picture in memory. Choose "edit picture in memory" from the menu and make your other selections, cropping as desired. Choosing inverse will save ribbons. This seems cumbersome, but even with a graphics card, printing Logo designs is time-consuming.
Amy Peritsky, Rochester, NY

Without Delay
I am writing in response to James Frey's letter (November Open Discussion) concerning the ALS Smarterm II and Compular's *Apple Writer II* preboot. I also have a Smarterm, *Apple Writer II*, and Compular's preboot disk, but I have not encountered the delay Mr. Frey has between keystroke and the character's appearance on the screen. I advise him to check what version he has. Mine is Version 1.2 and it works perfectly. With an eighty-column display, *Apple Writer II* is hard to beat.

Also, have any more experienced Smarterm II users come across the foreign language character sets or custom graphics mentioned in the specifications in the back of the manual?

Why is it that when you list around hex location C030, the speaker clicks several times? Is this the area of memory that controls the speaker, and if so why does it click? I was only looking at those values, not changing them. And then if you list up to C080, the computer hangs totally, requiring a power down. If anyone can answer any of my questions, I would really appreciate it.
Mike Zulauf, Miami, FL

Capitol Apple Pi
I would like to add Indigo Data Systems of Webster, Texas, to the list of companies with great consumer support. They are the makers of my 16K RAM card. Recently it stopped functioning, so I sent it back for repair. A few weeks later I received the card in the mail, free of charge!

In answer to Hari Wiguna (September Open Discussion), Washington Apple Pi, a Washington, D.C., area Apple group, offers a public-domain version of Forth 78 for $9. A full-screen editor and an assembler/disassembler are also available. Write WAP at 8227 Woodmont Avenue, Suite 201, Bethesda, MD 20814.
Richard Langston II, Gaithersburg, MD

Tractor on Track
In response to Karl F. Thompson (November Open Discussion), who mentioned that he was having problems with the tractor feed on his Okidata 93 dot-matrix printer: I recently purchased an Okidata Pacemark 2410 printer and was experiencing the same problem. My printer has both friction and tractor feed, and I assume that Thompson's printer is similarly equipped. Apparently the tractor and friction feeds are not designed to be used simultaneously. I have discovered that if one releases the friction feed, the tractor feed works perfectly. Since I made this discovery, the paper has never become misaligned in my printer.
Henry Chahin, Glendale, CA

Simulated Circuit Clouts
This is in response to Richard Ronsbottom's request (November Open Discussion) for sports-related software. In the August 15, 1982, issue of the *Milwaukee Journal* is a very favorable review of *Sports Complex* by Wolffware (Shorewood, WI), a disk of three simulations—golf, football, and baseball.

The baseball simulation was also reported in the *Milwaukee Journal* on April 14, 1983, when the paper sponsored a simulated World Series pitting the 1957 World Champion Milwaukee Braves against the 1982 American League Champion Milwaukee Brewers. The baseball program was also cited in the *Madison Capitol Times* on Sunday, July 17, 1983, and in the *Journal* the next day, regarding a simulation run for members of the Society for American Baseball Research at its annual meeting in Milwaukee.
Bruno B. Wolff, Jr., Shorewood, WI

Miscinfo Info
After reading Michael Yang's letter in your December Open Discussion column concerning Pascal and the Apple IIe, I would like to make a comment. Mr. Yang was on the right track when he stated that the System.Miscinfo file on Apple1: disk had to be changed in order to make use of the up and down arrows of the Apple IIe, but there is an easier way.

By executing the setup.code file on the Apple3: disk and following the instructions using the teach command, almost all of the commands regarding output to the screen can be changed any way you want them. As the program goes through the various commands available, simply press C for change and the key you desire for that particular command—up arrow, down arrow, even use the delete key for something if you want to, or change the control-

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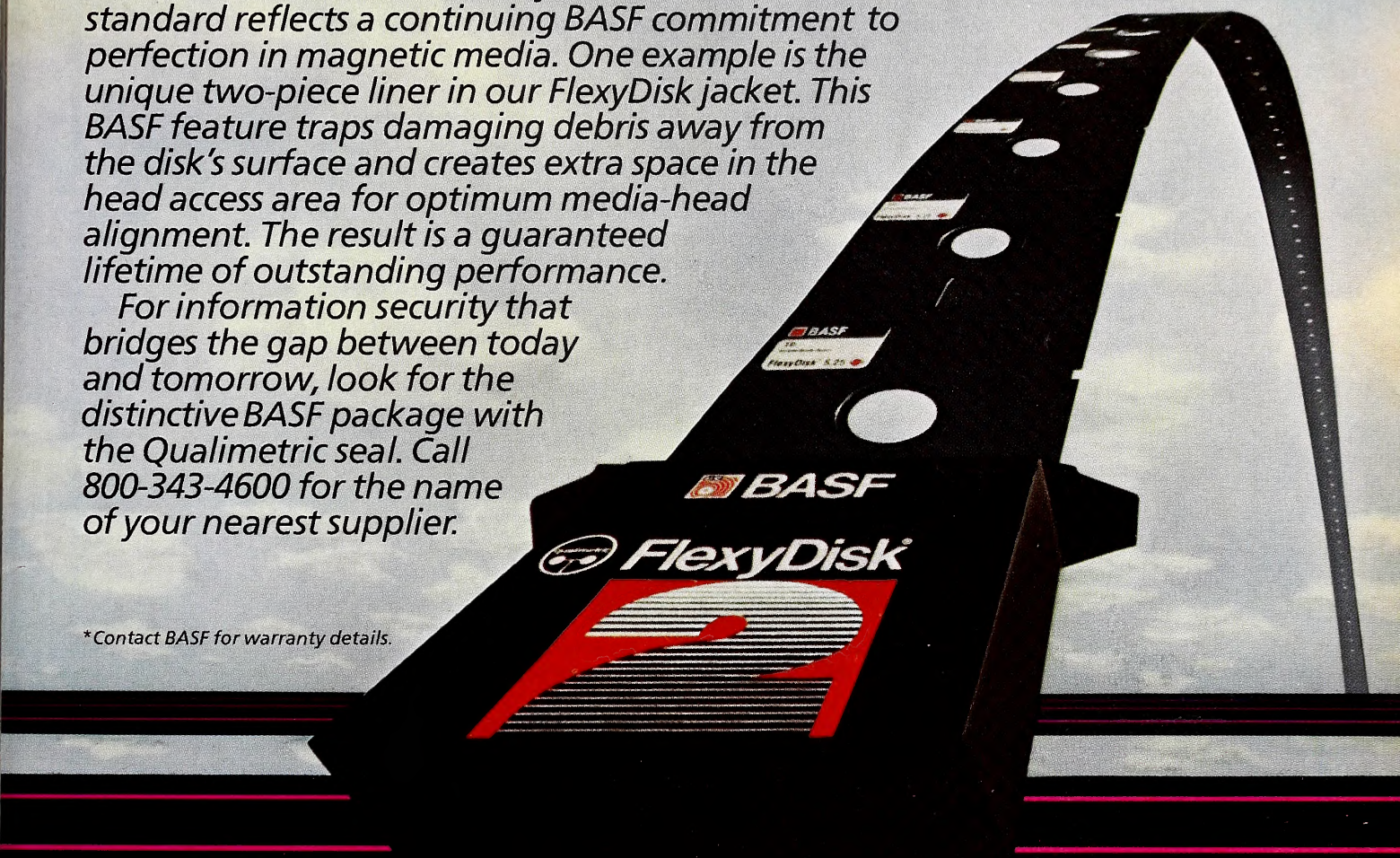

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C command in the edit mode to the open apple key. If you don't have an eighty-column card, you can even reformat your screen in the edit mode to forty columns (no more control-A!). These commands can be changed not only for an Apple IIe, but for any Apple.

At the end of the setup program, save the changes by pressing D for disk. The changes will be saved on Apple1: as New.Miscinfo. Then delete System.Miscinfo and rename the New.Miscinfo file System.Miscinfo using the filer commands. (Do this on your backup, not on the original.)

It's easy to do, and you get to take full advantage of your keyboard. Just make sure to note any not-so-obvious changes that you make in the keyboard commands.
Marc Dodson, Mission Viejo, CA

Public Forestry
The Oregon Vocational Forest Products Instructors Association is putting together a listing service for microcomputer programs in forestry that are in the public domain. This service is directed toward community college and high school forestry and logging instructors, with some interest shown by practicing foresters. We have been working on this project for about one year and have approximately fifty programs in our catalog. These programs are for a variety of computers, including Apple, TRS-80, PET, and various H-Ps. Most are written in Basic.

Persons on our mailing list receive a catalog update once a year. We also provide a disk-copying service for Apple and a list service for other computer models.

If any readers have public-domain software for any area of forestry that they feel would be appropriate to our efforts, we would appreciate their participation and contribution. Please mail all contributions to Les Martin at North Bend High School, Fourteenth and Pacific Streets, North Bend, OR 97459.
Les Martin, North Bend, OR

Sticking Around for the Specials
I have an Epson MX-80 and *Apple Writer II* software. How do you use all the Epson special features with *Apple Writer* without leaving the program?
James W. Keller, Decatur, GA

Speak to Me
We have a blind teen using an Apple IIe with an Echo II speech synthesizer from Street Electronics. We know of only a few suppliers of "talking" software so far. These are Bill Gumm of Computer Aids, David Halladay of Raised Dot Computing, and the Blind Apple Users Group out of New York.

If any readers can give us leads on other software that will work with speech, other hardware with greater versatility and compatibility for speech with existing software, or programmers who would be willing to adapt software for speech capability for us, it would be very much appreciated.

Also, thanks to Jerry Van Cleeff from Montgomery, Alabama, for writing in with the assistance on making an Apple IIe with an eighty-column card and an Amdek Color-I monitor more readable. Can any reader tell me the options and the advantages of the various boards to enhance the resolution on an Amdek Color-I Plus? We are a new family of users with an Apple IIe and want to improve on our screen, but need more education about the best way to do this.
Sherry Lowry, Houston, TX

Word Paddler
Can anyone tell me where we can find the hardware/software combination to provide a word processor that can be operated by a game paddle? My neighbor is almost totally disabled, having some small movement in her right hand only. She is currently using an Apple IIe with a mouth-stick, but most of the word processors require frequent use of two or more keys simultaneously—hard to do with a mouth-stick. I have heard that a paddle-controlled word processor is possible, since a quadriplegic engineer in Britain uses such an Apple to communicate and write articles, but I've not found such a program listed in this country.
David A. Mathewes, Cullowhee, NC

Student Counseling
To anyone who owns the Pascal language for an Apple IIe: Help! I'm a computer science major about to enroll in three Pascal courses. I recently purchased an Apple IIe with two disk drives. I've been calling stores and asking local Apple club members, and now I'm writing to find out which Pascal system I should obtain.

Do I need a language card? Is it wise to buy more memory, or more disk drives? Do I have enough memory in the first place?
Ed Lusky, Aston, PA

Up in the Air
I currently own an Apple IIe and would like very much to use it as an aid in flight planning. I am a pilot and travel quite a lot. I would appreciate hearing any information readers may have on flight-planning software.
Guy Evoniuk, Houston, TX

Stash the Flash
I have a simple technique to create a nonflashing cursor that I'd like to share with readers. It does not require coding a special routine in every program that uses it. It is an assembler routine used as an input exit. This way, it automatically takes effect for any input statements coded into the program.

Simply enter the following assembler code:

```
300: A9 0B A2 03 85 38 86 39
308: 4C EA 03 48 B1 28 38 E9
310: 40 91 28 68 3C 21 FD
```

Then bsave this routine. To make the cursor invisible, the bytes E9 40 at location $30F can be changed to A9 A0. This can be done on the fly by using two poke instructions. You can also get an underline character as a cursor by putting the code A9 DF at location $30F. Other variations are also possible.

I have come into possession recently of a copy of a program called *Microlisp*. I understand it has been around for some time, so maybe someone out there knows something about it. I cannot get it to do anything but print numbers I type in or print the word "nil." How do I make it do anything else? Can you give an example of something useful that I might be able to do it?
Dale Watson, Cincinnati, OH

Premature Punt
I am the sponsor of a high school computer club. For the last several years we've conducted a computerized football season using Strategic Simulations's *Computer Quarterback*. I have been very pleased with it, and my students really enjoy it.

Last spring I decided to update our game disk. After play-testing the new version, I found it to be more cumbersome and slower to play.

I contacted the company to see if I could get an original version. They said all their old versions were destroyed. I am hoping that someone with information about an old version of *Computer Quarterback* can contact me in care of Open Discussion.
Lynn Leopard, Chillicothe, MO

Roomer with an 8088
I recently saw the following ad on Buy-Phone, a local dial-up "computerized yellow pages":

> Roommate Wanted:
> I am looking for a roommate to share a two-bedroom apartment. Rent is $225/month and includes all utilities. You may also have partial use of my IBM PC computer.

Is Los Angeles setting a trend toward "Room and Baud"?
William Lappen, Los Angeles, CA

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IF I've written several programs in Applesoft that use shape tables. The tables were constructed using graph paper, converted to binary vectors, then to hex equivalents, and finally to decimal for incorporation into the Applesoft program.

The problem I have run into is this: I'll set the program up for animation using draw and xdraw, with hcolor = 3 (white) so that the shape will appear and disappear and then move to the next location. As long as the scale is set to 1, the program works great, but if the scale is any higher than that, the xdraw doesn't "undraw" all of the pixels and leaves an annoying few on the screen as the animation progresses. My shapes seem to work okay, but I can't seem to get this corrected. Am I doomed to shapes at scale = 1 for animation, is my program lacking a magical poke, or is my new Apple IIe in need of a trip to the IC doctor? *John C. Beach, Bossier City, LA*

THEN This one took a little playing around with, since I'd never really tried the draw-xdraw combination. First the easy answer, then the hard one.

Xdraw isn't really meant to function as an "erase." It reverses the dots on the screen. If they were on, it turns them off. If they were off, it turns them on. Normally, one wouldn't use a draw to put something on the screen, then an xdraw to take it off. One procedure is to draw in the color you want, then set the hcolor to the background color and draw again. Example:

```
5  REM Assume we load a shape table here
10 HGR : REM Clears screen to black
20 HCOLOR = 7 : REM We'll draw in white
30 DRAW 1 AT 20,20 : REM Draw the shape
40 HCOLOR = 0 : REM Set the color to the
   black background color
50 DRAW 1 AT 20,20 : REM This will erase the
   shape by drawing it in the black
   background color.
```

The other method is to use xdraws for both drawing and "undrawing." The first time, it will reverse the screen dots, thus displaying the shape. The second time, it will re-reverse them, leaving what was there originally. Because it simply reverses the background, xdraw has the advantage of being able to use it over any color or combination of colors without destroying the background. Example:

```
5  REM Load the shape table here
10 HGR : REM Clear to black again
20 XDRAW 1 AT 20,20 : REM Reverses the
   shape, drawing it in white
30 XDRAW 1 AT 20,20 : REM Reverses it
   again, erasing the shape
```

Those are the usual techniques with shape tables. Now the hard part. Since you draw your shape in white on a black background, why won't the xdraw erase it by switching the white back to black? I don't think it has to do with scale, since I managed to make it happen with scale = 1. Here's the probable answer:

Sometimes a shape can be designed so that it overlaps itself. Take, for example, the shape of a plus sign (+). You might first draw the vertical line, then the horizontal line. The two lines will cross, and the middle point will actually be plotted twice. When you xdraw it, that point is plotted with the vertical bar and then erased when you go over it with the horizontal bar! If you draw it first, you get the full plus sign in white. If you use draw to erase it, it will reverse out the vertical bar, thus erasing it (along with that point in the middle). It will then reverse out the horizontal bar, and the middle point will be set again! *Mark Pelczarski*

IF The command *poke 1010,102:poke 1011,213:poke 1012,112* is very useful in escaping control-reset. Under this command, whenever reset is hit, the program in memory simply restarts. It does, however, have one major drawback: All drive commands cease to function except Pr#6 and In#6. How can I prevent this from happening? *Ian Finseth, Menlo Park, CA*

THEN The reason DOS commands don't work if you change the reset vector is that DOS gets unhooked when the reset key is pressed, so that even though your program will rerun, DOS is out of the picture. You can prevent this problem from occurring by calling a routine in the Apple to rehook DOS. Just place this call near the beginning of your program and you should be all set. The command is: *Call 1002. Doug Carlston*

IF The *Renumber* utility on the DOS 3.3 System Master is a great program except that it frequently changes the values of some of the numbers in my programs when I use it. Am I doing something wrong?

Also, when I use the Basic command *get* in a program using a text file, the screen displays the first DOS command that follows the use of *get*. What's going on here? *Chuck Snyder, San Rafael, CA*

THEN The bug in *Renumber* is a specific and predictable one. It thinks that numbers appearing after an asterisk in a multiplication operation are line numbers. If such a number matches a line number that *Renumber* is changing, it will change the number after the asterisk as well. Here's an example:

```
10 FOR X = 1 TO 10
20 PRINT X * 10
30 NEXT X
```

If this program is renumbered to begin at line

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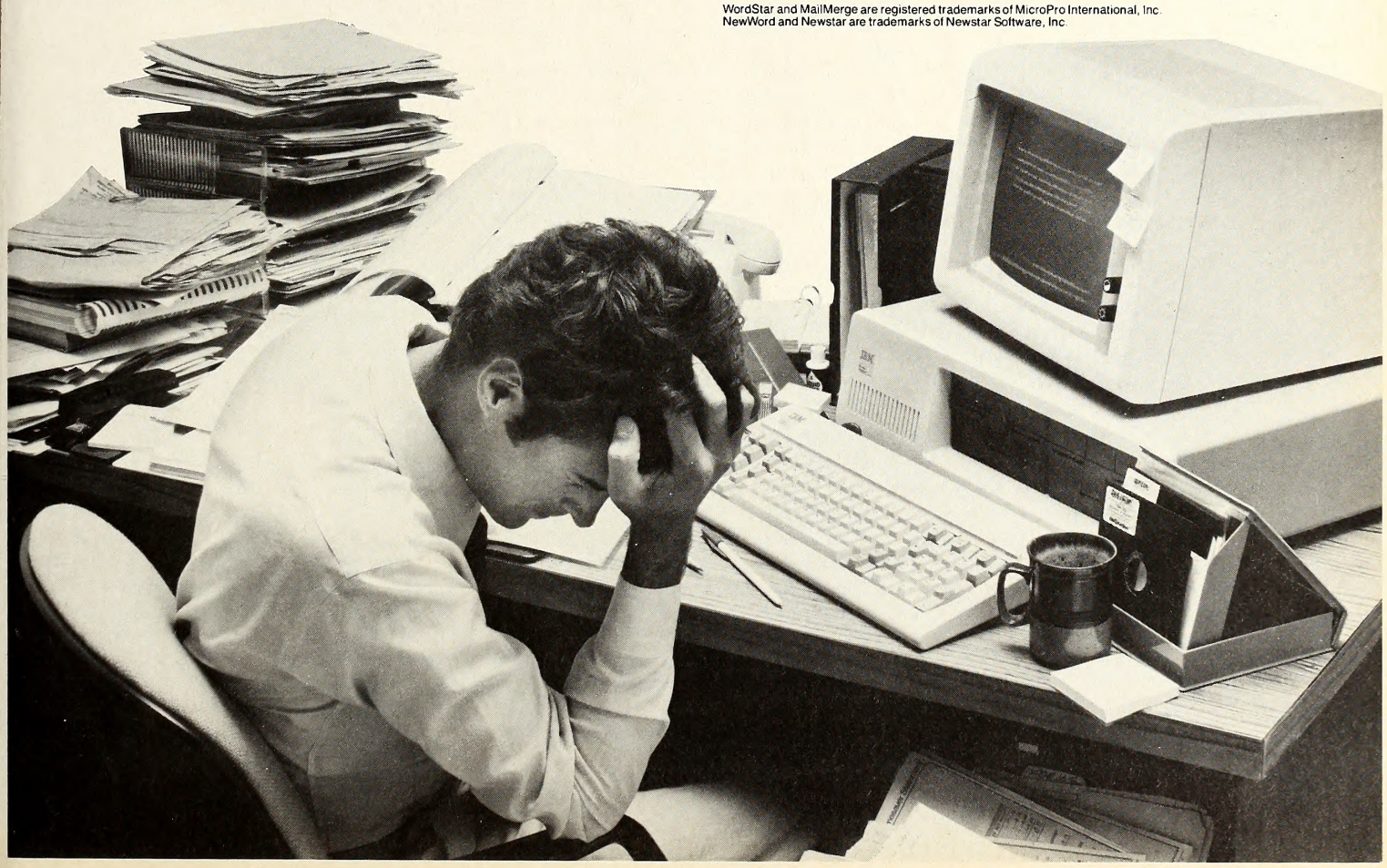

100 instead of line 10, the 10 in line 20 will be changed to a 100! This can be avoided by writing programs without numbers following asterisks in multiplication. So line 20 would be:

```
20 PRINT 10 * X
```

Changing your programming style to accommodate a bug in *Renumber* may seem a little silly. If you know anyone with an Apple IIe, the System Master that comes with that machine has a corrected *Renumber* that you should be able to copy onto your own disk.

To answer your second question, the easiest thing to do is to use *print* after a *get*. When you are using a DOS command after get, the control-D gets swallowed, so DOS doesn't recognize the command and prints it instead of executing it. *Doug Carlston*

IF I typed *Font Editor* from an earlier issue of *Softalk* and have a problem. When I save a font to disk, the type comes up unknown, instead of font. The size is 1,024 characters. What is the solution please? *Julian LeRoi Altenhaus, Maplewood, NJ*

THEN The *Font Editor* uses the *Request.inv* module to write out the font as a binary file. This operation leaves the file as type unknown. To actually change the type to font, there are two alternatives. First, the Pascal system "filer" has a file type change option. Second, the set of Basic invokable modules from Foxware Products (Salt Lake City, UT) includes a *Ftype.inv.* module that allows you to change the file type to font from within the *Font Editor*. Simply call the module after doing the "fwrite" in the *Font Editor*.

I have used this module and it works well. The set of modules is called *Basic Extension* and, in addition to the file type module, it contains routines to read and write matrixes, do direct block I/O, do high-speed array manipulation and string array searches, and lots of other goodies.

Another invokable package comes from CE Software (Des Moines, IA) and is called *Programmer's Power Tools III*. It is different, and very useful as well. It has, among other things, a high-speed sort. *Taylor Pohlman*

IF Can DOS be programmed into ROM chips so that you don't have to boot it when you need to use it? *John Woo, Bronx, NY*

THEN The biggest problem with putting DOS into ROM is that you wouldn't be able to modify it anymore—what would you do then with all the wonderful tips in DOStalk?

DOS would be difficult to put into ROM for two reasons. First, a large number of DOS's internal locations are used to store things. These data storage areas would have to be separated from the actual program code and kept somewhere in RAM.

The second problem is that DOS is big—bigger than Basic itself when you include all the buffers and data storage areas.

These problems aside, the reason nobody sells DOS on ROM chips is that Apple will only grant a license to distribute DOS on disk. For whatever reason, they refuse to allow the program to be sold as firmware. *Tom Weishaar*

IF I need to speed up the computer system I have written for my medical office. Currently, the entire system is written in Apple III Business Basic. It does everything I want it to do, but it is rather slow at data production when it is time to run the billing.

My long-range plan, already under way, is to rewrite the entire system in Pascal. However, that is some time away. For now, I need some invokable modules. My problem is that string locations in Basic are a secret. I realize they move, but I could greatly increase my speed if I could get to the string data in assembly language. I also realize that you cannot extend a Basic string. Below are two examples of what I want to do. If you can demonstrate "shorten," the easier one, I can handle the other. I know there are better ways to do these examples.

```
)invoke shorten,money
)name$ = "Smith "
)perform shorten(@name$):print
 chr$(34);chr$(34) "Smith"
)dollar$ = " 795" + " "
)perform money(@dollar$):print
 chr$(34);dollar$;chr$(34) " $7.95"
```

Raymond H. Sjerven, Kennewick, WA

THEN I suggest that you refer to the invokable modules I recommended to Julian Altenhaus. As to the two examples, try this:

```
name$ = mid$(name$,1,instr(name$," "))
```

As long as the shorten operation is to occur at the first blank character, the above will work fine.

For money, the most flexible technique is to open a text file and then use *print using* to format the result and input # to read it back (it's really fast, since everything's buffered in memory):

```
10 Dollar = 795
20 Open #1,"temp"
30 Print #1,0 using "2A,#.2#";"$";795/100
40 Input #1,0; Dollar$
```

Taylor Pohlman

IF I am writing in regard to Mr. Pelczarski's program published in the September 1983 *Softalk*. Using a KoalaPad for input, I am puzzled about the appearance of random spots of color on the screen, generally on the same horizontal line as the stylus. Also, I would appreciate a little more explanation on using the "zero cursor" mode. *Robert L. Wartburg, Orange, CA*

THEN I can only make a guess at the first answer, since you don't really describe what you're doing when it happens. The KoalaPad has some weird effects if you are in "continuous draw" mode, and it sounds like that is what you are experi-

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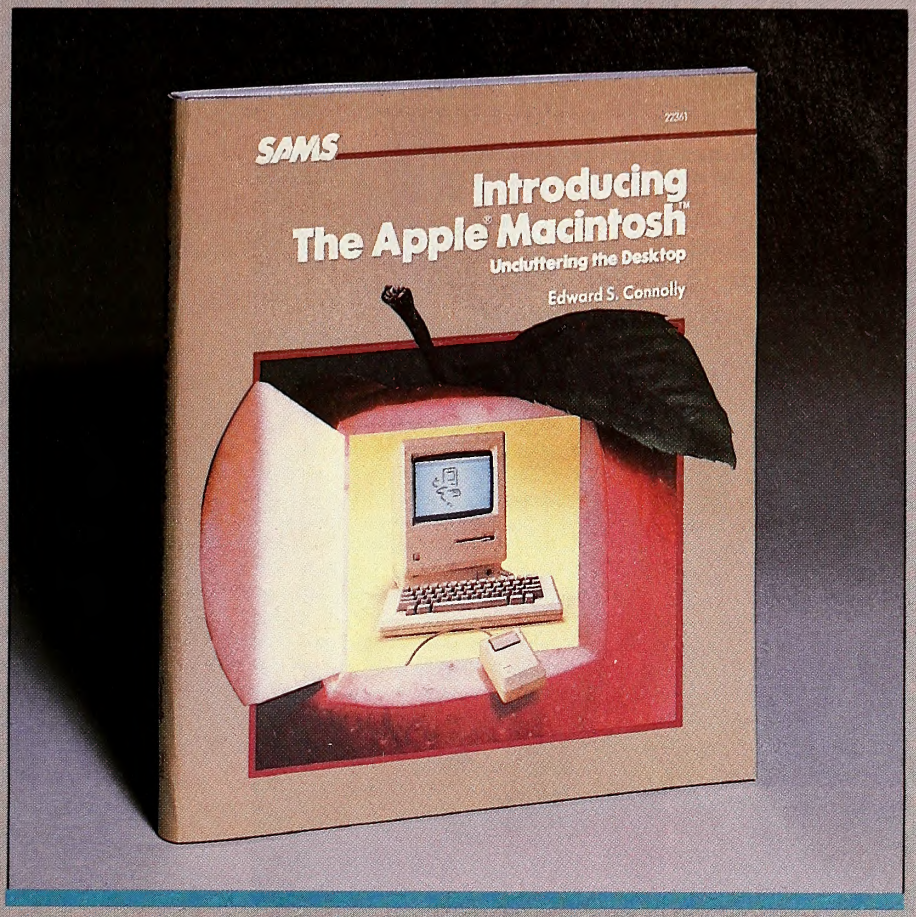

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encing. "Continuous draw" is when you are plotting without pressing one of the buttons, say freehand drawing, or with a simulated brush. If you don't keep constant pressure on the pad, it will return zeroes for the coordinates, meaning that if you let up a little bit you will see extra dots or plotting around the upper corner.

To see how a KoalaPad (or joystick, paddles, or trackball) returns coordinates, try the following program:

```
10 PRINT PDL(0),PDL(1)
20 GOTO 10
```

You will see two columns of numbers zipping up the screen. The left column is the X (horizontal) coordinate. The right column is the Y (vertical) coordinate. Most joystick devices will give a range of 0 to 255 for each. The KoalaPad gives a slightly smaller range. Note what happens when you release pressure from the pad.

Then again, it could be the software (I don't think so, but who knows what kinda crazy things theeza machines are gonna do?).

On the "zeroing" feature, the "Z" key toggles between a mode in which the joystick (paddles, touch pad, or whatever) covers the full range of the screen and a mode in which it is mapped to a small area of the screen. Normally, you can move your cursor all the way from left to right and top to bottom. Pick a point, move your cursor there, and press "Z." Now your cursor will not move any further than twenty dots from that point. The entire range of the joystick covers a much smaller area, giving you much greater control in that region. *Mark Pelczarski*

IF I read in the October issue of *Softalk* about the formula to change hex to base 10. I was trying to develop a formula like this to change base 10 to hex. Is there one? If so, I would really like to know what it is! *Bill Tomasi, New Berlin, WI*

THEN You ask this of a former math teacher? You've come to the right place.

The easiest way to convert from decimal to hex is by using integer division. That's the kind of division where 7 divided by 4 equals 1 with a remainder of 3, instead of 1.75. Take the number you want to convert to hex and divide it by 16, integer style. Set the remainder aside and divide the answer by 16. Keep this up until the answer is 0, and the remainders will give you your answer. For instance, to convert 341 from decimal to hex:

```
341 / 16 = 21, remainder 5
21 / 16 = 1, remainder 5
1/ 16 = 0, remainder 1
```

so 341 decimal is $155 hex. If you get a remainder that is from 10 to 15, don't forget to translate it to a letter from A to F.

Actually, neither conversion method is really a formula, since formulas don't work very well with the letters A through F. Here are two programs, one for hexadecimal to decimal, the other for decimal to hexadecimal. The first one uses the fact that the ASCII values of A through F are 65 through 70.

Hexadecimal to Decimal

```
10 PRINT "Enter a Hexadecimal Number. If
   you use anything other than the digits 1 – 9
   and letters A – F, who knows what uniquely
   weird results you will get?"
20 INPUT H$
30 D = 0 : FOR C = 1 TO LEN(H$)
40 A$ = MID$(H$,C,1)
50 IF A$ > = "0" AND A$ < = "9" THEN
   V = VAL(A$) : GOTO 70
60 V = ASC (A$) – 55
70 D = D * 16 + V
80 NEXT
90 PRINT "The decimal equivalent is ":D
```

Decimal to Hexadecimal

```
10 H$ = "0123456789ABCDEF"
20 INPUT "Enter a base 10 number : ";D
30 A$ = ""
40 Q = INT (D / 16)
50 R = D – Q * 16
60 A$ = MID$(H$,R + 1,1) + A$
70 IF Q THEN D = Q : GOTO 40
80 PRINT "The hexadecimal equivalent is ";
   A$
```

Note that in line 70 that "if Q then" means "if Q is true then," or "if Q is not equal to zero then. . . ." *Mark Pelczarski*

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Exec Sensible Software: Uncommonly Good

BY DAVE ALPERT

What's in a name? In one sense, it's the way we recognize ourselves. It's a way of capturing the sense of an object or, more important, of a concept or idea. Names can be based on whimsy and humor; some are designed to define a sensibility. Often a name is pretentious, attempting to expand the influence of its owner by virtue of assertion, while other names strive to be endearing or captivating by projecting rather than reflecting an image. Certain names, the best names, simply define their owners by suiting them perfectly . . . like Sensible Software.

"We're basically simple folk," says Sensible Software cofounder Allan Emery. But "Simple Software" would have been a misnomer. These people don't bring you simple programs, they bring you useful ones—sensible utilities for the person who wants to get things done with an Apple. Their programs help you organize, optimize, edit, and manage your files. The programs aren't designed to impress, but to be useful. They are sensible, like a coat that doesn't fall apart in three months or a car that gets you where you want to go without toting around an extra half ton of chrome.

Don't Forget the Motor City. Like many of the microcomputer software publishing houses, Sensible is a product of the hobbyist tradition. Two men, one a programmer and one a new computer owner fascinated by the world of silicon marvels, met in the Computer Connection store near Detroit. The programmer was Chuck Hartley, a veteran of the only game in town—the automotive industry—where he had put in some seven years in Ford's newfangled computer applications department. Chuck had purchased an Apple in 1978 and, sensible fellow that he was, figured he ought to write and sell programs and get a tax break. He had written a couple of utilities and even had some stuff published by Programma, where fledgling publisher Dave Gordon (now of Datamost) was cutting his teeth.

The other man was Allan Emery, M.D., fresh out of medical school and embarked on a career in gynecology and obstetrics. Emery had discovered microcomputers while finishing his studies. He bought a Radio Shack TRS-80 Model I Level IV 4K computer as a "diversion." Within a week he had decided that he wanted a machine that was more open, that would let him explore his growing fascination with the new technology. As luck would have it, he had purchased his first computer from a store that understood. They let him return his TRS-80, and Emery became the owner of a tape-driven Apple.

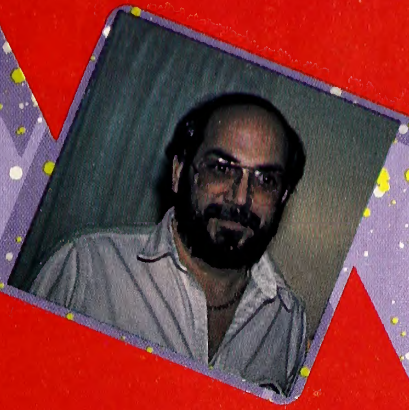
Emery got involved in what was then a fairly small community of enthusiasts and, like them, became a regular visitor at local computer dealers. One day he ran into a fellow at a store who was testing a newly developed disk file copy and transfer utility that he called *Super Disk Copy*. "I'm basically pretty shy," Emery explains, "and don't usually just start talking to people, but I was fascinated by this fellow and his program. So I just started talking to him. It was exciting just to . . . ask questions."

Before long, Emery and Hartley were friends. Hartley explained that he was negotiating a publishing contract for *Super Disk Copy* with Programma. He already had other programs listed in Programma's catalog and wanted to get his newest creation out into the world. When he told Emery the royalty figures being bandied about, Emery once again abandoned his shyness and told Hartley that he was crazy. It wasn't that Programma's royalties were low, but that Emery felt Hartley deserved more for his work. So the doctor with the burgeoning computer hobby and no business experience took the leap: "I can make you a lot more money," he told Hartley. And Hartley listened. Three months later, a partnership agreement was signed in Ypsilanti, Michigan, and Sensible Software became a reality.

Emery took over the day-to-day operations of the company, while Hartley wrote the programs that the company marketed. First there was *AOPT*, the *Applesoft Optimizer*, followed by *APlus*, another Applesoft enhancement utility. Sensible's third release, *Super Disk Copy*, was their first big success. About this time Apple released DOS 3.3, and both *Super Disk Copy* and another utility, *Multi Disk Catalog*, were updated to work with the new operating system. Sales took off, and in the last three months of 1980 Sensible Software started to take on a life of its own.

Close Encounters with the Third Partner. Not only was 1980 the year Sensible emerged as an established publisher of first-rate utility programs, it was also the year when the third partner showed up. Roger Tuttleman—a Chrysler employee working in the relatively undefined CAD

Clockwise from upper left: Allan Emery, cofounder of Sensible Software; Chuck Hartley, cofounder and programmer extraordinaire; Barry Fayne, the brains of the business; Edythe Emery, Allan's mother and bookkeeper extraordinaire; Joe Emery, Allan's father and Sensible's first full-time employee; Roger Tuttleman, Sensible's third partner and second programmer.



Sensible folk, left to right: Wendy Reiman, Edythe Emery, Liz Hartley, Barry Fayne, Joe Emery, Art Doran, Chuck Hartley, John Sopala, Roger Tuttleman, Marian Tuttleman.

area, where rules were so vague that he moved pretty freely among the myriad levels of the corporate structure—purchased his Apple in April 1980. Like Chuck Hartley, Tuttleman had begun by writing tools that he wanted but couldn't find on the market. His first utility was *Disk Organizer*, a program that manipulates disk catalogs in ways that Apple never intended. Besides programming, Roger was also active in user-group activities and became president of a Michigan Apple user group in the latter part of 1980. There he met Allan Emery, and the two began to talk. Tuttleman brought up the subject of having his utilities published, and suddenly Sensible Software was a little larger.

First Tuttleman's *Disk Organizer* was published, and then *Disk Recovery*. By early 1981, Sensible Software consisted of three partners. Tuttleman became the technical support department, as well as being a considerable help to Emery in the publishing end of the business.

Nineteen eighty-one and 1982 were eventful years for Sensible Software. This was the time when Sensible picked up a lot of its Applesoft programming utilities, along with the one program that more than any other seems to have put the company on the map: *Sensible Speller*. Originally released as *The Apple Speller*, the program is now in its fourth revision and remains the acknowledged leader in its field. It is a spelling checker, a program that compares word processing files with an internal dictionary and lets the user know where possible misspellings have occurred. It's Hartley's brainchild, although he credits Tuttleman and Emery with urging him to write such a program.

When it was released in late 1981, *Sensible Speller* had some competitors, such as *The Dictionary* from Sierra On-Line. But while it had competitors, it did not have much competition. People started to take notice of the program, and word spread that *Speller* did more than just check spelling. It gave useful information to writers, such as frequency of word use within a document, and it would even go so far as to suggest alternate spellings of suspect words, showing the context in which potential misspellings might appear. A little more than half a year later, Sensible delivered the follow-up punch by more than doubling the size of the word list in *Speller* and using the concise edition of the *Random House Dictionary of the English Language* as the basis for the program's glossary. At that point, there was no disputing which program was the best of its kind.

Sensible Speller is perhaps the best example of a single program controlling its own niche in the software marketplace. Apple Computer went to Sensible when it wanted a spelling checker to go with *Apple Writer III*, and Broderbund and the Bank Street College of Education knew where to look when they wanted a spelling checker as a companion program to the *Bank Street Writer*. Excellence can still earn respect in the fledgling software industry, even in the face of higher-powered marketing and more advertising dollars spent by the competition.

Locked Out and Backed Up. It was a bit prior to this that Sensible Software released its most controversial program: *Back It Up*, a nibble copier. Hartley wryly notes that *Back It Up* came out shortly after *Locksmith*, and that the latter program stole both the thunder and probably a good deal of the sales, but he doesn't seem to regret it. "*Back It Up* was always sort of a low-profile program," he says. "At times it's been painful to be its publisher. But with the copy cards, nibble copiers in general seem to be fading, and we're not as concerned about *Back It Up*." Tuttleman and Hartley are both quick to point out that Sensible has been in the protection business longer than they have been selling nibble copiers. And in what may be a double irony, one of Sensible's most popular programs, according to user polls—*Super Disk Copy*—has not sold enough to warrant its strong showing in the popularity polls. The salt in that particular wound is that when Sensible first got into the software business, it met some definite resistance from dealers who thought that *Super Disk Copy* was a nibble copier and who therefore wouldn't carry it!

In the meantime, Hartley had left his job with Ford at the end of 1980 to take a job with Prime Computer, working on CAD system development. That meant that Emery had to run the company while Hartley programmed on the East Coast. But Emery was also a practicing physician, meaning that he worked the doctor's usual twelve hours a day and then what seemed like another sixteen hours a day for Sensible. Numbers like that can only add up to trouble.

In November 1980, Emery's father, Joe, who had been helping out all along, became Sensible Software's first full-time employee. Emery's mother, Edythe, took over the bookkeeping for the company, even though she was working full-time as a bookkeeper elsewhere. She quit her other job as 1981 rolled to a close, thus becoming the second full-time Sensible employee. Tuttleman finally quit his job in January 1982 to work full-time at Sensible, but by that time the hours and the work had caught up with Allan Emery.

On Thanksgiving Day 1981, the heart of Sensible Software literally gave out; Allan Emery had a heart attack. A year of working from 6:00 a.m. until 3:00 a.m., seven days a week, had caught up with him. "I was literally killing myself," he says, "and I finally realized I couldn't do it all myself. I backed off a little and turned over a lot of the day-to-day stuff to others." Yet his enthusiasm seems never to have let up. Even while recovering in the hospital he was tinkering with computers—his family brought him a TRS-80 Pocket Computer. Emery's heart gave him another warning in the hospital, and this time bypass surgery was necessary.

At that point Emery had to make some hard decisions. His work (and workload) at Sensible were overwhelming only because that was the measure of his enthusiasm, of his love for what the company was. Yet medicine was, and still is, Emery's first love. He still participates in the business and policy decisions of Sensible Software, and he still handles some of the negotiations, such as those with Apple Computer that led to the Apple III *Speller* program. But Emery lets the others handle the daily chores and support work.

"I won't do to myself what I did before," he says, although he has hardly given up his enthusiasm for computers. Instead, Emery uses the knowledge he has gained to help out other people.

"It's almost trite, but it's true," he says. "This is like being in a true-life adventure. I'm a physician, yet I now sit on two school commit-

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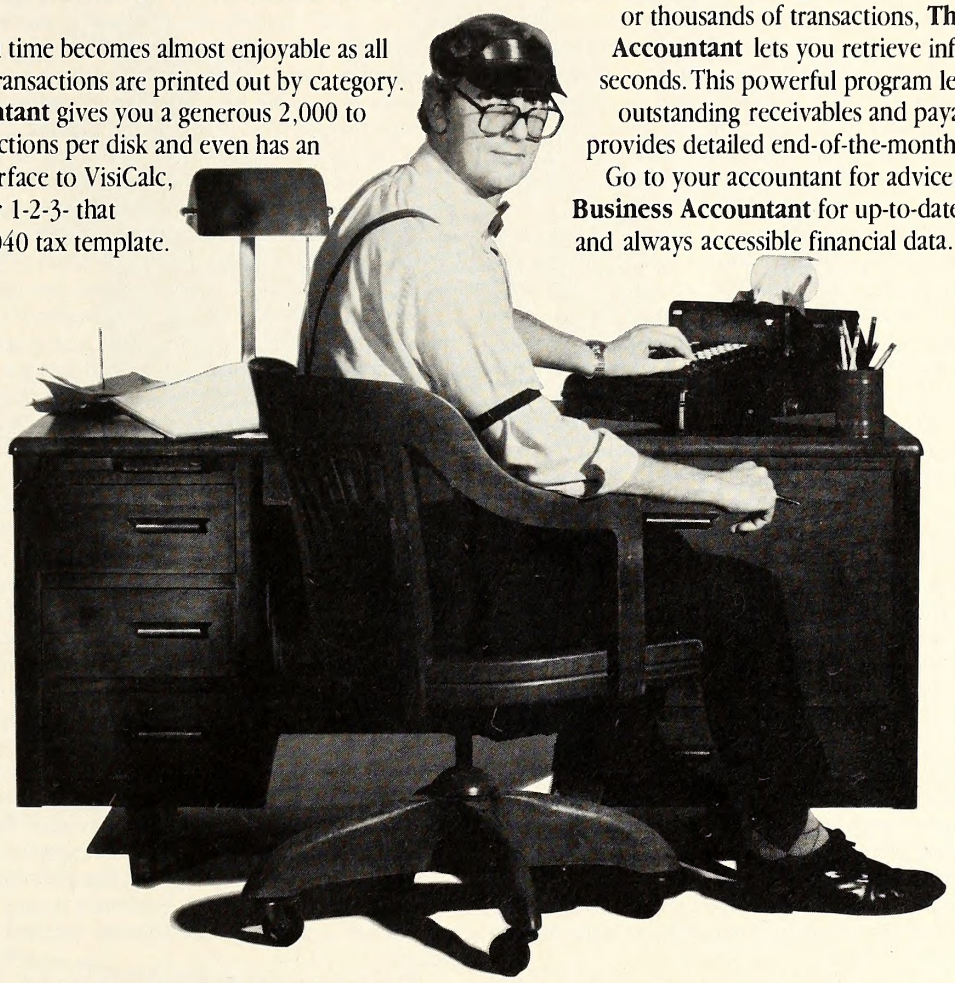

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tees. My involvement in computers has led me to the opportunity to help shape high-tech education in my community. Now I sit and talk with people who run factories or with school superintendents. It's a very gratifying feeling."

The Fourth Dimension. Most entities seem to seek internal balance. Sensible Software started with a clean dichotomy: Hartley the programmer and Emery the enthusiast. The third partner, Tuttleman, swung the balance to the side of programmers. A fourth partner could well have been a trick of destiny, or perhaps something more deliberate than that. He wasn't a programmer, though, and he brings to Sensible a degree of enthusiasm that any company needs to stay alive and fresh.

Barry Fayne is a lawyer, a man who met Emery socially. As he watched his new friend getting swept up in the excitement of microcomputers, Fayne also began to get caught up in this whirlwind new frontier. He helped set up the partnership, and later the corporation, that is Sensible and still talks of his own "sense of awe" about computers, what they can do and how they affect people's lives.

Whereas Chuck Hartley is relaxed, careful, and conservative in discussing the revolution he is helping along, Barry Fayne is brimming with enthusiasm. Whereas Allan Emery speaks with love and caring about a company that very nearly cost him his life, Barry Fayne pushes and plays with ideas and notions of the social effects of this new technology. Whereas Roger Tuttleman is something of a savant and speculator in the world of micros, watching and caring about hardware and software alike, Barry Fayne plays the part of the scattershot philosopher, thrilled and excited by the whole new world of ideas and possibilities opening up before him.

It is a delight to sit and talk with the partners of Sensible. There is no single, driving force in this company, but rather a lovely, albeit complex, balance. Each person has a lot to say, and all are articulate and well spoken. After a few hours, one begins to think that this is the way software publishing should be—no nonsense, no pretense, no hype. These people do what they do because they care about it. They put out good products because they could never see their way to doing anything else. There's no businessman sophistry here; they aren't in the business because it represented a get-rich-quick opportunity. Software isn't a commodity to them, it's something to be cared about, to be loved and nurtured.

These are folks who are sensible enough to learn from their mistakes and to make enough common-sense decisions to keep a thriving business alive and well. Remember, the only person in the company with any claim to a business background is Fayne, the last partner. For Hartley, Emery, and Tuttleman, business and marketing were disciplines best left to others until they were forced to come to grips with them.

Says Hartley: "The Apple market represented an accelerated learning curve in marketing and business for a lot of people. None of us had any experience; we just had to learn as we went along." When Emery and Hartley joined forces, Sensible went from small classified ads in local publications to display ads in national magazines such as *Nibble* and *Softalk*. Suddenly they had to start thinking about packaging, shipping, order taking, and supporting their products. Emery talks about the early days of standing in line at the local post office before making his way to the hospital, while Joe and Edythe remember the early-morning phone calls from Australia and all the telephone relationships with regular customers.

"We learned that service is the key," the elder Emery says. "We would get the orders and updates out within a day and get lots of congratulations for doing so. There's a lot of personal satisfaction there."

Around and Around. For Liz Hartley, Sensible Software first reinforced her dislike of Chuck's computing hobby and then led her full circle to become a computer enthusiast. "At first I took his computing very personally—it really affected our life! But my attitude has changed a lot since then. I use the computer a lot now, for orders and word processing. Word processing is just the greatest thing." Now Liz is in charge of packaging and production and, along with Joe and Edythe, seems to be the heart of the operations side of the business. It makes Sensible Software an extremely pleasant company to deal with, no matter what your business with them might be.

The kind of service and caring for customers dispensed by everyone at Sensible, along with the care that goes into the products, led to customer loyalty. "Repeat sales are definitely a big plus for Sensible," Hartley notes. "Some people now just automatically buy any of our new products." But any company has to adjust to the changing times and will notice that their market is a dynamic one, changing almost on a day-to-day basis. When Sensible started, there weren't very many companies and there were very few distributors or wholesalers in the business. "We were there when the distributors got started," Hartley says, "and they came to us. But I've noticed in the last nine months that it takes a hard push to get products onto their lists and into the market."

In the early days of the software business, Sensible, like most of their contemporaries, sold to any and all customers. Now the entrance of wholesalers and middlemen into the market has changed the way they do business. "Sometimes we need to send away the lucrative direct sales in order to prime the pump, to get the distributors going," Chuck says.

The business has grown steadily due to the ethic of quality and service. There are some ten people employed by Sensible on either a part-time or contract basis. Duplication of disks is performed by Barbara Lubeski and John Sopala, who work according to demand, while packaging is handled by Art Doran and Wendy Reiman under Liz Hartley's direction. Marian Tuttleman, married to Roger, handles much of the correspondence engendered by the software publishing business. After years of steady growth, the company is moving into formal offices in nearby Oak Park, Michigan, this month.

Hackers Away. The way that software is sold isn't the only change the folks at Sensible have noted in the software industry. The types of products that sell have changed, and Sensible is trying to change with the times. While the original focus and raison de'être of Sensible Software was to create the tools that were missing from the marketplace, the whole microcomputer market has changed. "We're starting to concentrate less on what we want," Chuck says, "and more on what we think other people might want." That translates into fewer utilities for the hobbyist, the hacker, or programmer, and more tools for the computer user.

Sensible's latest offering, *The Graphics Department*, is a tool for businessmen to put together charts and graphs—something of an integrated package for the Apple II. It lets the user make charts, label them, insert them into other documents, or put them into a slide show. It isn't meant to be a flashy program, but one that integrates the necessary tools for a businessman to put together a workmanlike presentation.

Another program, *Report Card*, is a specialized database manager that tracks classes, grades, and test results for school teachers. Barry calls it a program for educators that avoids the issue of whether computers and education are a valid combination. Instead, it's just plain useful. *Bookends* is another specialized data management system, this time focused on reference materials. Again, it is directed not at the traditional hobbyist, but rather the computer user. *Tele-porter* is a modem package, not a terminal program. It is designed to let two Apples exchange data in the most efficient—and thus least expensive—way possible.

There are other decisions facing the people of Sensible Software, ones that epitomize the dilemmas of software publishing. By the time this article is published, Sensible will have released *Report Card*, its first piece of IBM software. It won't be the last program the company will do for that computer. For Hartley, the move into the IBM marketplace represents "long-term insurance for expansion." Yet he admits a definite fondness for the Apple market that goes beyond a sentimental attachment for where it all started. Tuttleman is quite direct about it: "The Apple market is a much more friendly segment of the industry than any other."

This Is Supposed To Be the New World. All the principals of Sensible Software seem to be looking forward to watching the progress of Macintosh ("The exciting thing is the price," Chuck says) and feel that Apple is taking some pretty strong and aggressive steps to reposition itself. As businessmen and partners, they all voice the need to diversify their product line, to spread out into heretofore strange areas for Sensible.

Yet somehow there's still a smile and a little more than a vested interest when they talk about Apple. There's love and caring. It shines through in their conversation and in their faces when they talk about the last five and a half years. But most of all, it shines through in their products, both in quality and design.

Sensible's offerings aren't products thrown together in search of a market. They are thoughtful exercises in the design and execution of utilities—programs that are, by definition, useful. They are, like the name of the company itself, a perfect reflection of the people who make them. ■

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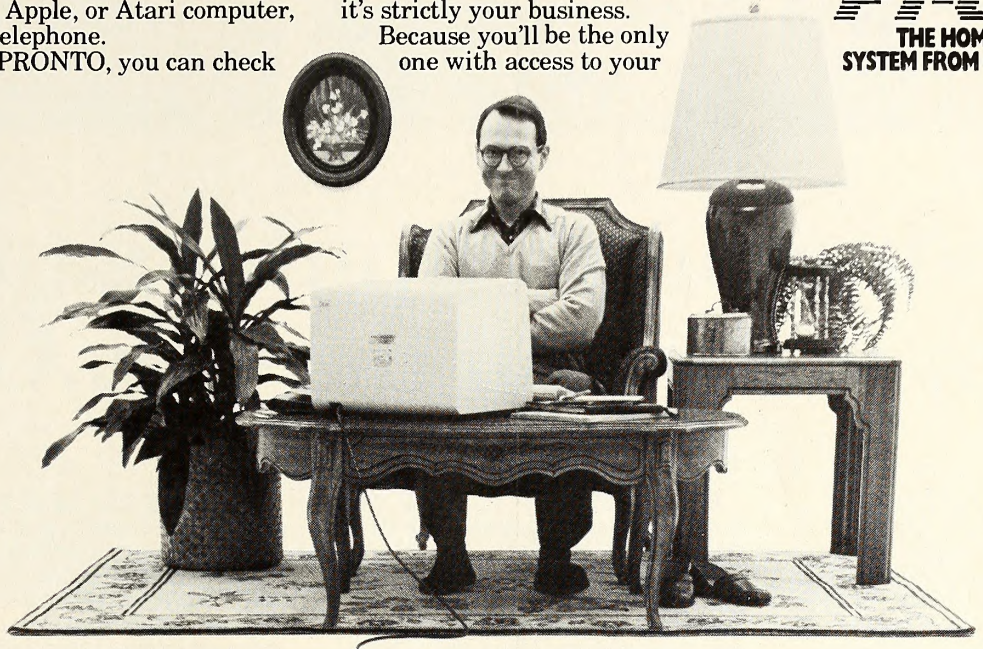

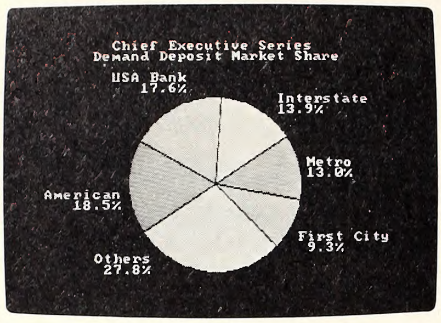

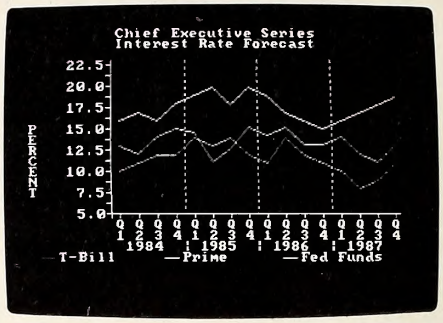

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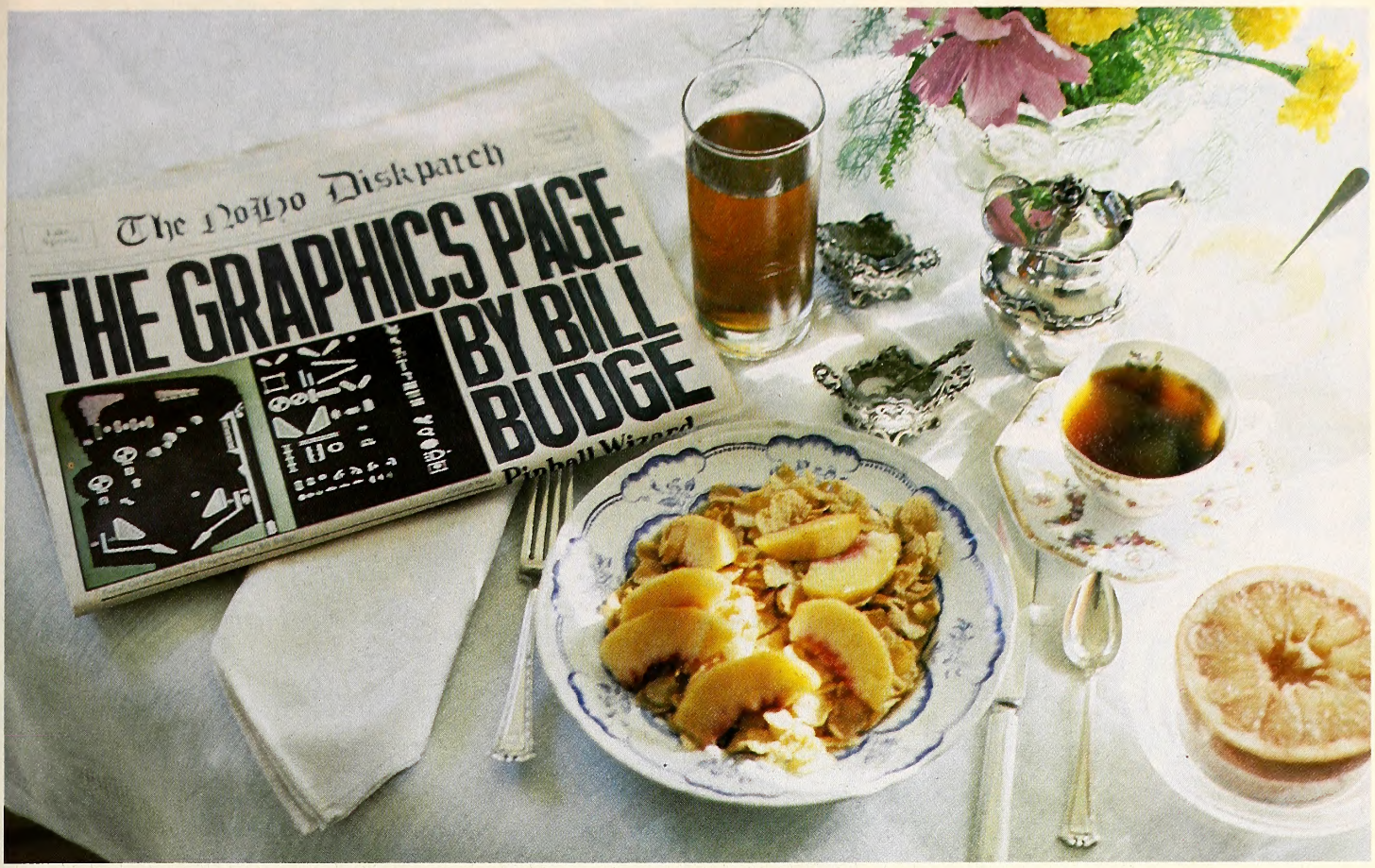

Pretzel Logic

So far, we have glossed over the concept of patterns. This is not because it is unimportant or trivial—far from it. In fact, we will devote the whole of this month's column to pattern drawing because it is a unifying concept—one of those rare and valuable approaches that solve many problems at once and simplify our thinking as well. We will find that much of the complexity of the Apple II graphics screen can be absorbed by patterns, much as our screen tables allowed us to forget about the complicated memory mapping of the hi-res screen. As a result, our graphics package will benefit by having a simpler interface and a wider range of applications.

To see why patterns are such a good idea, we will first take a quick look at the way ideas about how to draw on the Apple screen developed historically. We will see that later developments have been folded back to embrace a whole range of problems solved earlier by other methods, rather than following a direct and logical evolution. We call this kind of problem solving, where new results provide us with elegant and unforeseen solutions to old problems, *pretzel logic*.

Lost in the Mists of Time. In the beginning, all was black and white. The Apple could do color, but most of the early software didn't use it in hi-res. This made drawing on the screen of the Apple simpler for the programmer, since turning on a pixel was the same as turning on a bit in screen memory. This is still the simplest view of Apple hi-res.

Of course, one of the nicest things about the Apple is that it has a color hi-res display, and very early on people were using the six hi-res colors. This required new drawing routines, since a color pixel involved at least two bits. Now there were two views of Apple hi-res: black and white, and color.

It wasn't long before there was some experimenting with halftone or "comic book" colors. By combining the six real hi-res colors in regular ways, it was possible to have twenty-one colors on the screen. Again, this was a new way of looking at the Apple screen, and it too required new drawing routines.

By the time the Apple II was a few years old, there were probably as many different ways of thinking about hi-res as there were Apple programmers. Often a programmer would have a set of graphics utilities for each kind of hi-res drawing and could switch from one set to another in the same program as the drawing required. This state of affairs couldn't help but add to the confusion about Apple graphics that continues today. With the new Apple IIe double hi-res mode, it might seem as though things are getting worse.

In the last two years, we have seen the introduction of good drawing and sketching programs for the Apple II. One of the common features of these programs is the filling of areas with patterns. After selecting a small, rectangular "swatch" of a pattern from a menu, the user can then cause objects to be drawn with that swatch, repeated as often as necessary.

The filling pattern is usually aligned with the top left corner of the screen (or of the current screen window in more sophisticated systems). The size and shape of a swatch is critical in determining how simple it will be to implement pattern filling and how fast a program will run. For this reason, swatches are always rectangular and of a size and shape compatible with the hi-res screen.

New Apples Heard From. This still leaves us with many possible choices. We could make an arbitrary decision as to pattern swatch size and treat pattern filling as just another special effect. This gives us a new capability, but only by adding complexity to an already complex subject. This is unfortunate, because as we will show, a careful choice of swatch size gives patterns even greater power and generality.

On Macintosh and Lisa, patterns are eight-by-eight arrays of bits, arranged as eight consecutive bytes. Each bit corresponds to a pixel, since these machines have black-and-white screens. The choice of an eight-by-eight swatch size was dictated by the fact that these hi-res screens are organized into bytes, and by the fact that eight by eight is the right size to specify the most useful patterns, including many halftone shades of gray (figure 1). A different swatch size, say 7 by 7, would have severely limited the patterns that could be drawn. Since neither Macintosh nor Lisa can display color, this halftoning capability is extremely important for making interesting pictures.

Things are not as clear-cut on the Apple II. Our screen is organized into bytes, but only seven of the bits correspond to pixels on the screen.

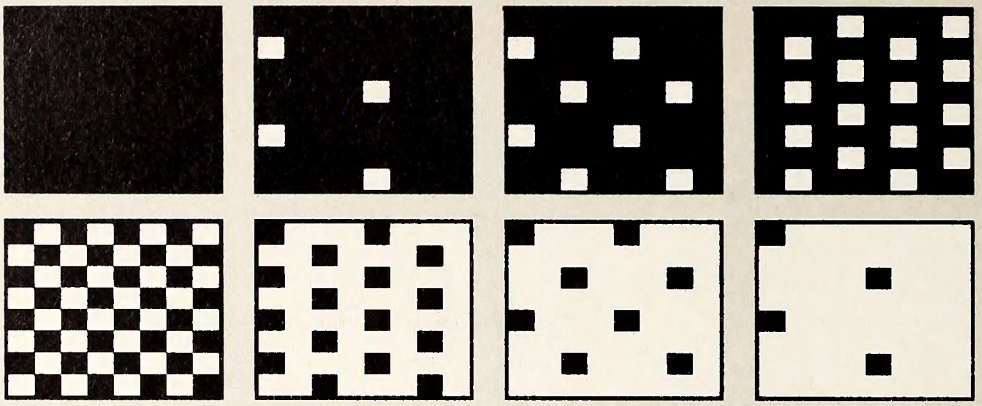

Figure 1. 8 by 8 halftones.

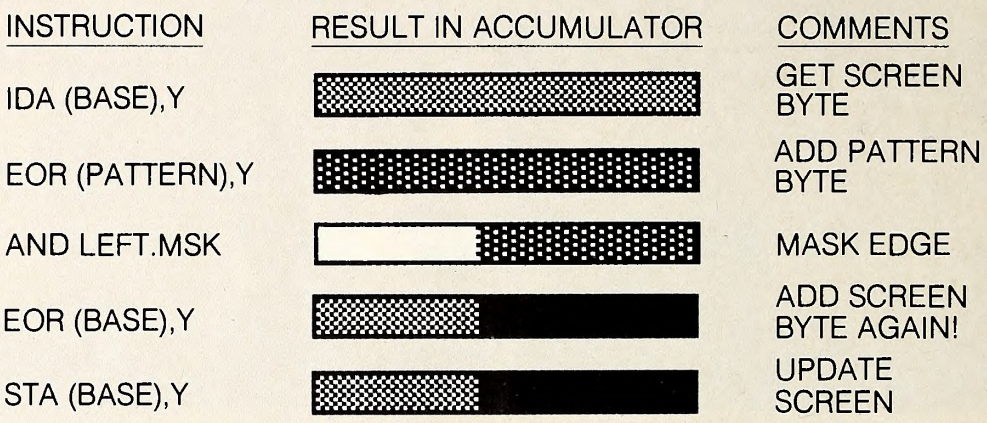

Figure 2. Filling an edge with pattern.

The simplest kinds of patterns to implement would be those that were consistent with this seven-bit system. However, swatches that are seven bits wide aren't satisfactory on the Apple II because hi-res colors involve even numbers of pixels. Since seven is odd, we wouldn't be able to expand such a pattern and get true Apple colors.

Any swatch size that is an even number of pixels will allow us to make patterns in color. Clearly, then, our swatch width should be an even number.

To handle the halftone or comic book colors, the swatch width and height must both be even, which means that our pattern swatches must be at least two by two pixels. Even better would be four by four pixels, since this size makes even more color halftones possible.

Double hi-res with sixteen colors requires swatches to be some multiple of four dots wide (sixteen colors require four bits per pixel), and double hi-res halftoning requires swatches of at least eight by two pixels.

High-Bit Hassles. We will adopt eight by eight as our swatch size, because it allows us to do all of the above operations and to use all of the patterns available on the Macintosh and Lisa computers. As it turns out, this swatch size is surprisingly easy to implement.

The high bit of a screen byte, which we have not considered until now, poses some problems. We would like our patterns to take advantage of the full six-color capability of the Apple II, but there is no place to put the high-bit information in our pattern swatch, since all eight bits of each of the eight bytes are used for actual pixel information. By adding an extra byte to the swatch, we can specify, for each of the eight rows of the pattern, whether the high bit of our pattern rows should be on or off. Thus, our patterns now consist of eight pattern bytes and one "sign" byte.

We can now begin to appreciate the main point of this month's column: that with this careful definition of pattern, we no longer need to worry about the idiosyncrasies of Apple II color graphics. To switch between the different ways of drawing, a user of our graphics package need only call SetPattern with the proper pattern data. Given a small library of patterns, a user can draw in black and white, color, halftone color, or even double hi-res without knowing a thing about high bits, odd pixels, or any of the other esoterica of Apple II hi-res.

All that remains now is to show how we can implement eight-by-eight patterns efficiently. After all, what good is elegance if no one uses it because it is too slow? We will now see how easy it is to expand eight-by-eight patterns.

The main problem with pattern filling is figuring out what parts of the pattern data go where on the hi-res screen. On the Apple II this is complicated, because our patterns are defined by an eight-by-eight array while the screen bytes display only seven pixels. It takes some work to expand the pattern data out into screen form, and this work will be repeated many times to fill large objects.

Once again, it will make sense to take this computation out of the HLine drawing primitive and instead to put it in an auxiliary routine, which we have called SetPattern. This routine will expand the pattern data into a large pattern buffer that contains eight full scanlines of pattern. This buffer can then be consulted whenever we need to know which part of the pattern to put on-screen. This is a kind of table lookup, but the table is generated anew whenever the pattern is changed. The result is that the HLine fill-pattern handler is simple and fast.

The strategy falls apart if we are drawing lots of small objects in different patterns, because then the work of setting the pattern overshadows the real work of drawing the object. But pattern drawing is usually applied to large objects, so in most cases we win.

The only thing that HLine has to figure out now is which pattern buffer row it should use to draw a horizontal line. If we wish to align our patterns with the top left corner of the screen, it's easy—HLine simply gets the Y coordinate of the horizontal line on the screen and takes its remainder when divided by eight. This tells us which pattern row to use.

***Assembly Language Discussion.** The listing shows SetPattern, which gets its pattern argument using a pointer passed in the A and X registers. It then expands each pattern byte into a whole row by shifting and adding in high (sign) bits. A significant point is that it is easy to expand eight pixels into a scanline (forty bytes) of hi-res bytes; it seems as though the 6502 was designed to do things like this.

In order to understand how HLine's pattern-filling handlers work, we

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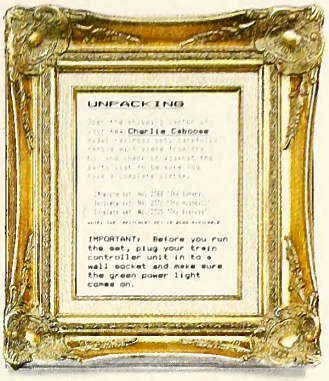

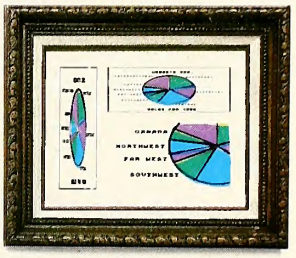

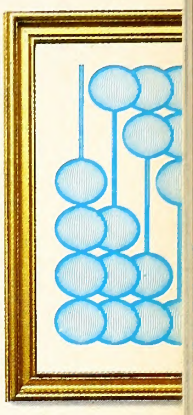

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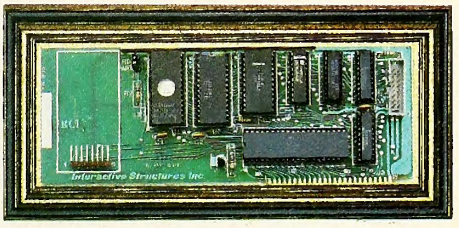

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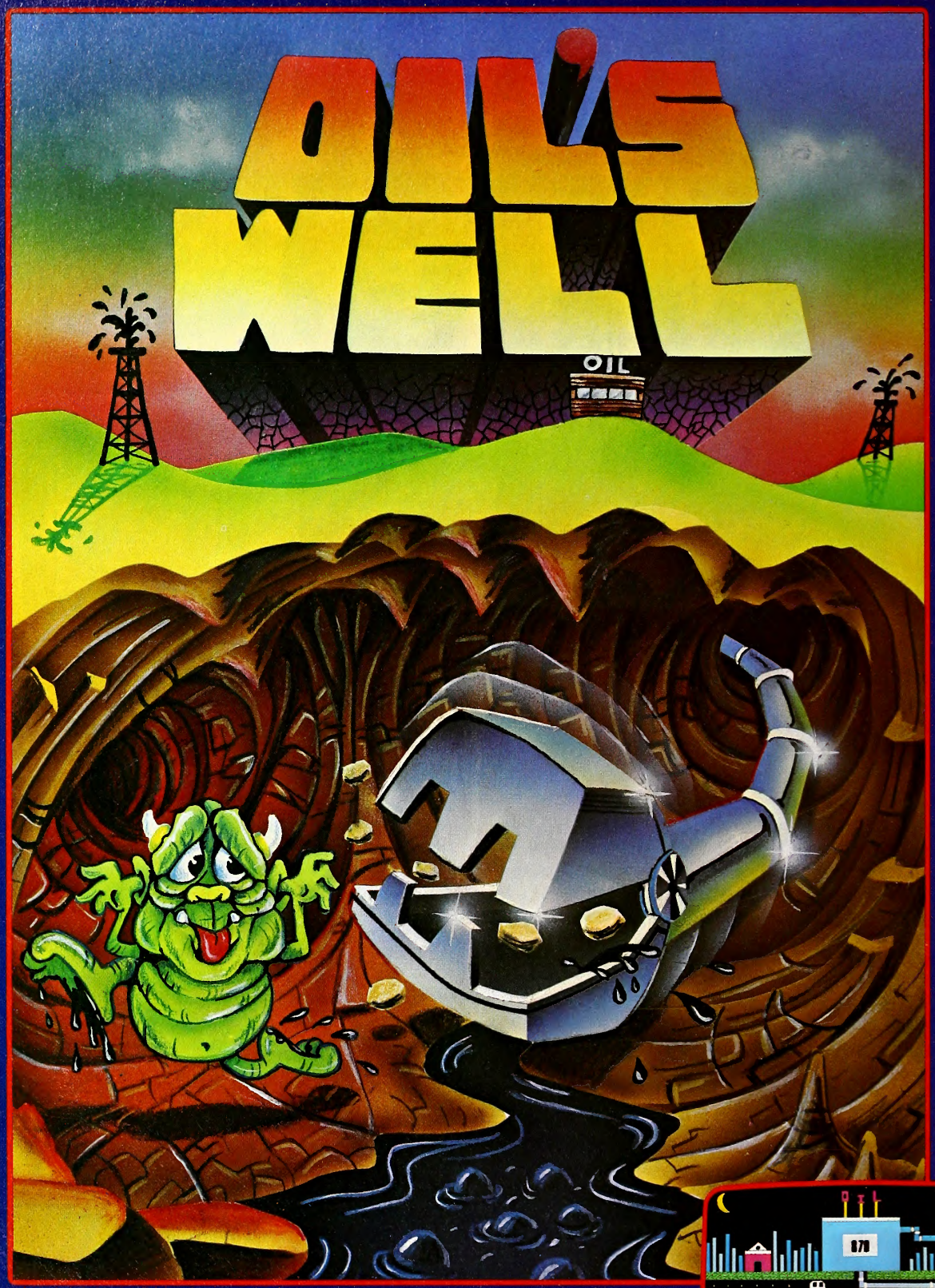

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must refer to last month's listing. Examine the handler for mode 4 in particular. For the middle bytes of a horizontal line, the handler simply transfers data from the appropriate expanded row in the pattern buffer onto the hi-res screen:

```
FillPat.1 lda (pattern),y
FillPat.2 sta (base),y
          dey
          cpy left.d7
          bne FillPat.1
```

For the edges, the handler takes advantage of a trick to combine pattern data from the buffer with the screen data that must be preserved. At first glance, it might seem that two masks would be required for this operation—one to preserve screen bits, and the inverse mask to clear out the screen bits where the pattern is to go. Instead, by using the EOR instruction twice, we get by with one mask, and thus fewer instructions. Figure 2 shows how the instructions accomplish this.

Finally, look at the beginning of HLine. The very first thing HLine does when a pattern mode has been requested is to decide which row of the pattern buffer to use in the filling process. It puts the address of that row in the zero page location called Pattern, which the FillPat and EorPat handlers use to address the pattern buffer. A self-modifying JMP instruction is used to eliminate this overhead from the modes that don't use the pattern buffer.

Drawing a rectangle is a simple operation, and we now have the tools to perform it, though we will do things a bit differently in our final package. We will assume that the rectangle is stored in zero page locations X1, Y1, X2, and Y2. These represent the leftmost, topmost, rightmost, and bottommost coordinates respectively, and they are in screen space (between 0 and 279 for the Xs and 0 and 191 for the Ys). The drawing will be done in the color red, using the fill-pattern mode:

```
          jsr  SetFill       ;fill mode
          lda  #red          ;set pattern to red
          ldx  #<red
          jsr  SetPattern

DrawRect  jsr  ScanPrms      ;get byte/mask values for edges
DrawRct.1 ldx  y1
          jsr  HLine         ;draw a row of the rectangle
          inx
          cpx  y2
          bcc  DrawRct.1     ;continue until last row is done
          beq  DrawRct.1
          rts

red       dfb  $55,$55,$55,$55,$55,$55,$55,$55 ;odd pixels
          dfb  $FF                ;all hi-bits on
```

That concludes our low-level primitive HLine and the related SetGMode, ScanPrms, and SetPattern. Up to now, we have taken it on faith that these routines would prove useful in drawing more complicated geometrical objects such as rectangles and polygons.

The next step, then, is to build on this foundation a set of higher-level subroutines. In a way, this will be an easier and more enjoyable task, since HLine isn't really very powerful by itself and because there were so many subtleties in its design and assembly language implementation.

Next month: coordinates, clipping, and viewing. ❑■

The SetPattern Routine.

```
50F3:                    252 ;
50F3:                    253 ; set drawing pattern: make 4 scanlines of pattern
50F3:                    254 ;
50F3:          0009      255 pat.bufr    ds   9
50FC:                    256 ;
50FC:85 62               257 SetPattern  sta  base          ;A,X -> pattern
50FE:86 63               258             stx  base+1
5100:A0 08               259             ldy  #8           ;get 9 bytes (8 x 8 bit array
5102:B1 62               260 SetPat.1    lda  (base),y     ;  and 8 bits of sign info)
5104:99 F3 50            261             sta  pat.bufr,y
5107:88                  262             dey
5108:10 F8     5102      263             bpl  SetPat.1
510A:                    264 ;
510A:A9 18               265             lda  #pat.buf+280 ;build last row first
510C:85 64               266             sta  pattern
510E:A9 09               267             lda  #<pat.buf+280
5110:85 65               268             sta  pattern+1
5112:                    269 ;
5112:A2 07               270             ldx  #7
5114:2E FB 50            271 SetPat.2    rol  pat.bufr+8   ;get sign bit for this row
5117:A9 00               272             lda  #0
5119:6A                  273             ror  a
511A:85 61               274             sta  temp+1
511C:BD F3 50            275             lda  pat.bufr,x   ;get pattern byte
511F:                    276 ;
511F:A0 27               277             ldy  #39          ;expand from 8 bits to 280 bits
5121:85 60               278 SetPat.3    sta  temp         ;  (40 bytes)
5123:4A                  279             lsr  a            ;convert to 7 bit format
5124:05 61               280             ora  temp+1       ;add hi-bit
5126:91 64               281             sta  (pattern),y  ;put it in buffer
5128:A5 60               282             lda  temp         ;prepare next byte
512A:6A                  283             ror  a            ;C was lo-bit after lsr
512B:88                  284             dey
512C:10 F3     5121      285             bpl  SetPat.3
512E:                    286 ;
512E:A5 64               287             lda  pattern      ;space rows 40 bytes apart
5130:38                  288             sec
5131:E9 28               289             sbc  #40
5133:85 64               290             sta  pattern
5135:B0 02     5139      291             bcs  SetPat.4
5137:C6 65               292             dec  pattern+1
5139:CA                  293 SetPat.4    dex               ;do 8 rows
513A:10 D8     5114      294             bpl  SetPat.2
513C:60                  295             rts
```

Figure 2.

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THE PASCAL PATH

By Jim Merritt

Jungle Fever, Part 13

Time To Get Packed. Many months ago, we noted that the identifier String was in some sense equivalent to the declaration "PACKED ARRAY [0..80] OF Char." At the time, we agreed to ignore the keyword PACKED because it was irrelevant to our discussion. We promised ourselves, however, to investigate this mysterious keyword at the proper time, which just happens to be now.

First, you should enter and execute the following program:

```
PROGRAM
  SizeDiff;
  VAR
    UnpackedString
      :ARRAY [0 .. 80] OF Char;
    TrueString
      :String;
    PackedString
      :PACKED ARRAY[0 .. 80] OF Char;
BEGIN (* SizeDiff *)
  WriteLn(Output,    'SizeOf(UnPackedString) = ',SizeOf(UnPackedString));
  WriteLn(Output,    'SizeOf(TrueString) =     ',SizeOf(TrueString));
  WriteLn(Output,    'SizeOf(PackedString) =   ',SizeOf(PackedString));
END    (* SizeDiff *).
```

The execution of SizeDiff produces this display:

```
SizeOf(UnPackedString) = 162
SizeOf(TrueString) =      82
SizeOf(PackedString) =    82
```

As you can see, UnPackedString occupies 162 bytes of primary (RAM) memory, while TrueString and PackedString each occupy only 82 bytes. (Experienced computer enthusiasts and long-time readers of this column will recall that a *byte* is an eight-bit chunk of information, and that one byte corresponds, roughly, to one printable character.)

You may wonder why UnPackedString is so much larger than TrueString and PackedString, even though each of the three accommodates exactly the same amount of information: 81 individual characters. (For now, let's ignore the fact that TrueStrong[0] actually represents the dynamic length of TrueString and cannot be accessed as a Char value under normal circumstances.) Before we address the question directly, we need some background information concerning the p-machine.

The Word Is Given. Remember, the p-machine is a hypothetical processor, the "machine instructions" of which correspond closely to the features of the Pascal language. The Apple Pascal p-machine is, in fact, a program that emulates the operation of this hypothetical computer. In other words, the p-machine emulator program makes your Apple appear to be the "ideal p-machine."

The 6502 central-processing-unit (CPU) chip in your Apple is often described as an "eight-bit microprocessor." This simply means that the 6502 was optimized to manipulate information a byte at a time. Although it is certainly possible to use the 6502 to handle individual bits (or to deal with structures that contain many bytes), it is *easiest* and *quickest* to work with an entire byte at once. In general, one 6502 machine-language instruction controls the processing of a single byte. To process either an individual bit or several bytes, you must typically use more than one instruction.

The unit of information most conveniently used by a particular computer is called that machine's *word*. The number of bits in a word is known as the *word size*. Since a group of eight bits is also called a byte, computers that are optimized to handle eight-bit words are sometimes referred to as "byte-oriented machines." When speaking of such computers, the terms "word" and "byte" are synonymous. This is not necessarily true of other machines, however. For instance, a "word" is thirty-two bits to the MC68000 CPU that lies at the heart of Apple's Lisa and Macintosh computers. (Actually, the MC68000 handles units of eight, sixteen, or thirty-two bits with equal facility. Because thirty-two bits comprise the largest "word" the chip can handle, that word is referred to as a thirty-two bit CPU.) Thus, a "Lisa/Mac word" equals four bytes, while a "6502 word" is exactly one byte. Word sizes of eight, sixteen, and thirty-two bits are commonly found in today's personal computers, but some popular computers intended for industrial or scientific use boast word sizes of four, twelve, sixty, and sixty-four.

Different computers offer different word sizes primarily for reasons of *cost* and *convenience*. The larger the word size assumed by a particular CPU, the more circuitry the CPU unit must include. The MC68000 chip contains *many* more circuits than the 6502. It is also, by virtue of its relative complexity, much more expensive. When either processor is suitable for a certain job, the prudent and frugal computer systems designer will usually choose the 6502 over the MC68000 simply because it costs less.

Often, however, a processor's suitability for a particular task is determined more by its word size than by its cost. For example, we know that an ASCII character may be represented by a single byte. Since text may be considered as strings of ASCII characters—that is, as strings of individual bytes—it is convenient (and appealingly inexpensive) to use a byte-oriented machine for text-handling applications. On the other hand, suppose we wish to design a computer that processes digital audio according to the recently developed standard for compact discs (CDs). In this case, we might wish to employ a sixteen-bit CPU, since the standard unit of digital audio information is a sixteen-bit word. The so-called "number-crunching" computers used by scientists and the military routinely process very large (actually, highly precise) real numbers. Consequently, these machines are optimized to handle large words—often, sixty-four bits or more—in order that they may more easily treat huge numbers as indivisible units.

The Apple Pascal p-machine emulates a sixteen-bit computer. Thus, the typical p-code instruction manipulates two (adjacent) bytes at once, treating them as a sixteen-bit word. From this point on, when we talk of a "word" we will be referring to a p-machine word—that is, a sixteen-bit chunk of data. As always, an eight-bit chunk of data will be called a byte.

To access any particular *byte* of information using a sixteen-bit computer, you must usually fetch the word in which the byte is stored, then extract the byte from (or inject the byte into) the word. (A similar process is followed to isolate *any* series of consecutive bits within a word.) This two-step procedure necessarily involves more than one machine instruction and is therefore more costly than word-oriented computing in terms of both RAM space and execution time.

The Compiler's Word Play. Unless told otherwise, the Pascal compiler assumes you want your programs to run as quickly as possible and to take up as little RAM memory as possible. Thus, the compiler normally produces object code that stores and accesses data as whole words or multiples of words. For example, any individual Char, Boolean, or Integer datum is typically stored in the space of a single word, while a Real datum occupies exactly two words (four bytes). This policy can waste a great deal of RAM memory on data. Consider the case of UnPackedString versus TrueString and PackedString. Each of the

three variables permits the storage of *exactly* as much information as the others—no more, no less. However, UnPackedString occupies nearly twice the RAM memory required by either of its siblings. This is because each element in UnPackedString is stored in a whole word, while each element in TrueString and PackedString is stored as a byte. (Taking a slightly different point of view, you could say that, for TrueString and PackedString, a pair of elements is *packed* into each storage word.)

The SizeDiff program demonstrates the essential power of the keyword PACKED, which is to force each element of a particular ARRAY or each field of a particular RECORD to be stored in as little space as possible (even at the cost of a decrease in program execution speed and/or an increase in the size of object code). The syntax diagram in figure 1 implies that PACKED may precede the keywords ARRAY, RECORD, FILE, and SET. The Apple Pascal compiler, however, will pack only ARRAYs or RECORDs. While it permits you to specify a SET or FILE as PACKED, it takes no special action to optimize these structures. As a matter of fact, Strings, SETs, and FILEs don't *need* to be packed; they are *guaranteed* to occupy minimum storage (in RAM or on disk) by virtue of the methods used to implement them under Apple Pascal. The compiler ignores, but allows, the keyword PACKED in FILE and SET declarations in order to maintain compatibility with other Pascal compilers that can pack these structures. In any case, it is strictly illegal to pack elementary data (that is, individual Integer, Boolean, Real, or Char variables), so the Apple Pascal compiler complains of error number 10 ("error in type") when it encounters such declarations. The program BadPacks includes examples of both redundant and illegal PACKED declarations. Try compiling it if you wish to verify the claims made here concerning the behavior of the compiler.

```
PROGRAM
  BadPacks;
  TYPE
    (* In the following two declarations,
       the use of PACKED is NOT permitted.
    *)
    BadA =      PACKED Real;
    BadB =      PACKED Integer;
    (* In the following declarations,
       the PACKED is allowed but ignored.
    *)
    BadC =      PACKED SET OF Char;
    BadD =      PACKED FILE OF Integer;
BEGIN (* BadPacks *)
        (* nothing here *)
END   (* BadPacks *).
```

Penalties for Packing? From what we've said so far, you might get the impression that access to a "PACKED ARRAY OF Char" is slower or involves more object code than access to the unpacked version. In other words, operations on UnPackedString should require fewer p-codes and execute more quickly than identical operations on, say, PackedString. You can test this hypothesis for yourself by compiling and executing the following program. (Remember, the *shaded* portions of the listing are *not* part of the program and should not be included in your source text file; this extra diagnostic information is provided by the compiler as it lists your program during the compilation process.)

```
  1  1  1:D   1  PROGRAM
  2  1  1:D   3    TestCPack;
  3  1  1:D   3
  4  1  1:D   3    VAR
  5  1  1:D   3      UnPackedString
  6  1  1:D   3        :ARRAY [0 .. 80] OF Char;
  7  1  1:D  84      TrueString
  8  1  1:D  84        :String;
  9  1  1:D 125      PackedString
 10  1  1:D 125        :PACKED ARRAY[0 .. 80] OF Char;
 11  1  1:D 166
 12  1  1:D 166      I, J
 13  1  1:D 166        :Integer;
 14  1  1:D 168
 15  1  2:D   1    PROCEDURE Beep;
 16  1  2:D   1    (* Cause Apple Speaker to emit audible beep *)
 17  1  2:0   0    BEGIN (* Beep *)
 18  1  2:1   0      Write(Output, Chr(7));
 19  1  2:0  10    END   (* Beep *);
```

APPLE II Outperforms IBM PC with 'Supermini' Virtual Memory Technology

If you need to get SERIOUS, POWERFUL, PROFESSIONAL results from your II+/e, for Business or Engineering applications, nothing comes close to MegaTASK PLUS! Modelled on and developed from minicomputer-based commercial timesharing software available to large corporations for thousands of dollars annually, MegaTASK PLUS is primarily designed for the APPLE II owner who demands quick, effective analytical solutions to business problems—and immediate RELIEF from the frustrations and limitations of using hundreds of dollars of mutually-incompatible 'canned' software packages, or WORSE, programming in Applesoft, assembly or Apple DOS!

MegaTASK PLUS is a combined, multi-product hardware-and-software package that provides an instant **Virtual Memory** expansion, an Applesoft-compatible **SuperBASIC,** and a series of **Business Management** packages that greatly enhance the power and value of the APPLE II in both **systems programming** and **business applications** areas. MegaTASK and MegaDOS employ multitasking, virtual memory optimization and virtual storage technology, which, until now, were limited only to mainframes and the 'super' minicomputers. The SMARTCHIP™, an Intel 8748 Single-Chip Plug-In Microcomputer, provides sufficient processing power to enable your APPLE II to outperform both the IBM PC and Apple's new MacIntosh computer. Yet, all you need to begin is an APPLE II series computer plus one diskette drive. And generally, no modification to your existing Applesoft programs, assemblies and DOS 3.3 files is necessary.

MegaTASK and MegaDOS accordingly generate an enormous enhancement to the power available to the APPLE II owner, specifically:

- Multitasking System processing techniques. (As many as 16 PROGRAMS or TASKS can execute at one time).
- The MegaDOS VS/OS (Virtual Memory Operating System) can place within reach of your system MEGABYTES of Virtual Memory. Largest program size: 8 Megabytes. Largest ISAM file: 451 Megabytes. Largest transparent core array: 75 million FP numbers.
- 100-400 new Mainframe Basic commands bring machine-language speeds to interpretive Basic. Powerful instructions comprise extensions to Applesoft that include many of the most useful commands found in FORTRAN, COBOL, PL/1, ADA, PASCAL and LOGO.
- Enormously simplified ease of programming—modular, insulated routines, localized variables, ability to pass variable names. Dependence on line numbers **totally removed.**
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- Hardcopy and screen Business Graphics, Calc, Database Management and Word Processing Applications Packages—plus Custom Modifiability.
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- Manuals for MegaTASK, MegaDOS and MEGABASE II in sparkling white binders
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- A One-year Replacement Warranty on all products.
- A 60-day Financial Risk-Free Return Policy. If you are not completely satisfied you can return the product in good condition with proof-of-purchase for a complete refund.
- A 14-hour-per-day telephone Hotline to support you in your use of the entire MegaTASK PLUS series of software packages.

Because of the much larger amount of memory that is available to the Apple's microprocessor through Virtual Memory, the increased processing speed, and the integration of major applications packages PLUS custom modifiability by users who know Basic, MegaTASK PLUS may well surpass or replace most of the worthwhile APPLE II program packages currently available on the market. With the introduction of this product, Quantum Leap has made a commitment to be the technology leader in the area of business software systems for personal computers. This will be achieved through Quantum Leap Technologies' continuing Applications Software Package Series—quarterly diskettes and manuals mailed free to purchasers of MegaTASK PLUS for one year from date-of-purchase.

Quantum Leap software systems are designed to give you, the user, powerful professional and business tools with which to get the day's work done faster, more pleasantly, and more professionally. We live in an exciting age for personal computing. **Multitasking and Virtual Memory** promises to make any computer substantially more powerful than is possible with currently limited memory (Byte Magazine Editorial, March 1983). Only MegaTASK PLUS offers you these technologies. PLUS, standard Applications Packages to capitalize on them—all available for your APPLE II!

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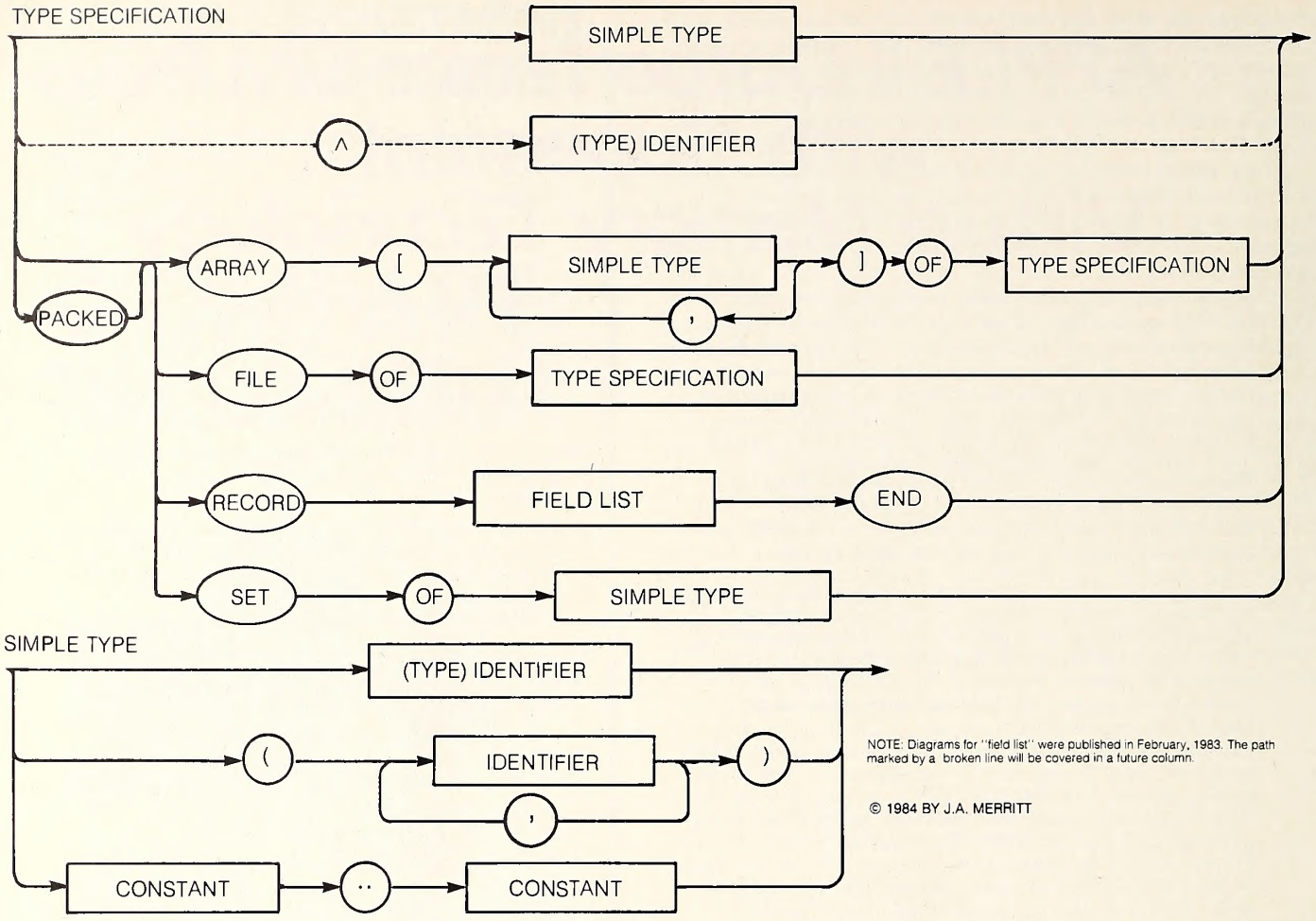


Figure 1. Type specification.

```
20  1   2:0   22
21  1   1:0    0   BEGIN (* TestCPack *)
22  1   1:1    0     WriteLn(Output, 'TESTCPACK: Test Pascal
                     Char Packing');
23  1   1:1   57     WriteLn(Output);
24  1   1:1   65
25  1   1:1   65     (*$R-*) (* eliminate index range-checking
                     code;
26  1   1:1   65                test speed of unrestrained element-
                               access *)
27  1   1:1   65     WriteLn(Output, 'Press <RETURN> key when
                     you are ready');
28  1   1:1  122     Write(Output,    ' to time access to
                     UNPACKEDSTRING');
29  1   1:1  168     ReadLn(Keyboard);
30  1   1:1  176     FOR I := 0 TO 1000 DO
31  1   1:2  195       FOR J := 1 TO 80 DO
32  1   1:3  212         UnPackedString[J] := 'A';
33  1   1:1  241     Beep;
34  1   1:1  243     WriteLn(Output);
35  1   1:1  251     WriteLn(Output, 'Test complete');
36  1   1:1  284     WriteLn(Output);
37  1   1:1  292
38  1   1:1  292     WriteLn(Output, 'Press <RETURN> key when
                     you are ready');
39  1   1:1  349     Write(Output,    ' to time access to
                     PACKEDSTRING');
40  1   1:1  393     ReadLn(Keyboard);
41  1   1:1  401     FOR I := 0 TO 1000 DO
42  1   1:2  420       FOR J := 1 TO 80 DO
43  1   1:3  437         PackedString[J] := 'A';
44  1   1:1  464     Beep;
45  1   1:1  466     WriteLn(Output);
46  1   1:1  474     WriteLn(Output, 'Test complete');
47  1   1:1  507     WriteLn(Output);
48  1   1:1  515     WriteLn(Output, 'Press <RETURN> key when
                     you are ready');
49  1   1:1  515     Write(Output,    ' to time access to
                     TRUESTRING');
50  1   1:1  572     ReadLn(Keyboard);
51  1   1:1  614     FOR I := 0 TO 1000 DO
52  1   1:1  622       FOR J := 1 TO 80 DO
53  1   1:2  641         TrueString[J] := 'A';
54  1   1:3  658     Beep;
55  1   1:1  685     WriteLn(Output);
56  1   1:1  687     WriteLn(Output, 'Test complete');
57  1   1:1  695     WriteLn(Output);
58  1   1:1  728     (*$R+*) (* return to civilization — not really
59  1   1:1  736                necessary but good practice
60  1   1:1  736                nevertheless *)
61  1   1:1  736
62  1   1:1  736     WriteLn(Output, 'END OF PROGRAM');
63  1   1:0  770   END   (* TestCPack *).
```

In using TestCPack, you should start a timer as soon as you press the return key at the beginning of each test, then stop it as soon as you hear the beep that signifies the end of the test. A watch or clock with a sweep second hand is adequate for purposes of the test, although a stopwatch (either analog or digital) would be better. Don't worry about the sluggishness or variability of your reaction time; the test results should remain fairly accurate, even if your reaction time varies as much as two or three seconds between tests. (Nevertheless, you should do what you can to minimize the variance.)

TestCPack produces some rather startling results. As we expect, access to the individual elements of PackedString takes the same amount of time as comparable access to TrueString. Yet access to either of the PACKED ARRAYs is almost 10 percent *faster* than access to UnPackedString! Moreover, the listing for TestCPack shows that the number of bytes emitted by the compiler for the assignments to either PackedString (464−437 = 27) or TrueString (685−658 = 27) is actually

7 percent *less* than the number emitted for the assignment to UnPackedString (241−212 = 29).

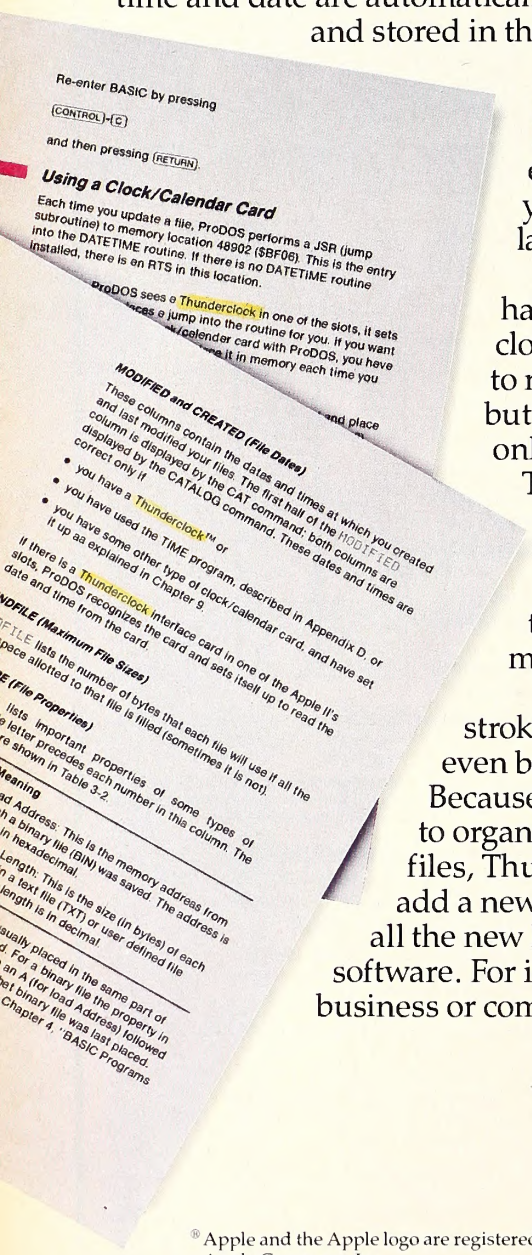
Apparently, access to Strings and PACKED ARRAYs OF Char is *more* efficient, in terms of both time *and* space, than access to unpacked Char structures. If we believe our test data, then are we to conclude that our theory about data packing is wrong? Before we give up hope, let's try a slightly different experiment. The following program, TestDPack, compares access efficiency between PACKED and unpacked ARRAYs OF Boolean:

```
 1   1  1:D   1 (*$S+ *) (* just to be safe!! *)
 2   1  1:D   1 PROGRAM
 3   1  1:D   3   TestDPack;
 4   1  1:D   3
 5   1  1:D   3   (* To modify this program to deal with almost any
 6   1  1:D   3      simple type of data to be PACKED, you need
 7   1  1:D   3      only change the CONSTant TestVal and the
 8   1  1:D   3      TYPE definition Data. You may have problems
 9   1  1:D   3      if you define Data as an enumerated type or
10   1  1:D   3      a structure, though. In the first case,
11   1  1:D   3      you cannot define TestVal as an enumerated
12   1  1:D   3      constant, because you cannot define the
13   1  1:D   3      TYPE before the CONST section. In the
14   1  1:D   3      second case, Pascal prohibits you from
15   1  1:D   3      expressing RECORD or ARRAY constants
16   1  1:D   3      altogether, so TestVal must be changed
17   1  1:D   3      to a variable, and its fields or elements
18   1  1:D   3      must be initialized by assignment state-
19   1  1:D   3      ments in the program code.
20   1  1:D   3   *)
21   1  1:D   3
22   1  1:D   3   CONST
23   1  1:D   3      MaxReps=     1000;
24   1  1:D   3      MaxInx=      79;
25   1  1:D   3      TestVal=     True;
26   1  1:D   3
27   1  1:D   3   TYPE
28   1  1:D   3      Data=        Boolean;
29   1  1:D   3
30   1  1:D   3   VAR
31   1  1:D   3      UnPackedA
32   1  1:D   3         :ARRAY [0 .. MaxInx] OF Data;
33   1  1:D  83      PackedA
34   1  1:D  83         :PACKED ARRAY[0 .. MaxInx] OF Data;
35   1  1:D  88
36   1  1:D  88      I, J
37   1  1:D  88         :Integer;
38   1  1:D  90
39   1  2:D   1   PROCEDURE Beep;
40   1  2:D   1   (* Cause Apple Speaker to emit audible beep *)
41   1  2:0   0   BEGIN (* Beep *)
42   1  2:1   0   Write(Output, Chr(7));
43   1  2:0  10   END    (* Beep *);
44   1  2:0  22
45   1  1:0   0   BEGIN (* TestDPack *)
46   1  1:1   0    WriteLn(Output, 'TESTDPACK: Test Pascal Data
                  Packing');
47   1  1:1  57   WriteLn(Output);
48   1  1:1  65
49   1  1:1  65   WriteLn(Output,'SizeOf(UnPackedA)= ',
50   1  1:1  96           SizeOf(UnPackedA));
51   1  1:1 116   WriteLn(Output, 'SizeOf(PackedA)=    ',
52   1  1:1 147           SizeOf(PackedA));
53   1  1:1 165   WriteLn(Output);
54   1  1:1 173
55   1  1:1 173   (*$R− *) (* eliminate index range-checking code;
56   1  1:1 173                test speed of unrestrained element-
                              access *)
57   1  1:1 173   WriteLn(Output, 'Press <RETURN> key when
                  you are ready');
58   1  1:1 230   Write(Output,    ' to time access to
                  UNPACKEDA');
59   1  1:1 271   ReadLn(Keyboard);
60   1  1:1 279   FOR I := 1 TO MaxReps DO
61   1  1:2 294      FOR J := 0 TO MaxInx DO
62   1  1:3 307         UnPackedA[J] := TestVal;
63   1  1:1 331    Beep;
64   1  1:1 333    WriteLn(Output);
65   1  1:1 341    WriteLn(Output, 'Test complete');
```

Apple's® new ProDOS™ is pro Thunderclock™

When Apple designed their new ProDOS operating system for the Apple II family, they included an important new function—the ability to automatically read a clock/calendar card. Nice touch.

It means that every time you create a new file or modify an existing one, the time and date are automatically recorded and stored in the CATALOG.


Re-enter BASIC by pressing

(CONTROL)-(C)

and then pressing (RETURN).

Using a Clock/Calendar Card

Each time you update a file, ProDOS performs a JSR (jump subroutine) to memory location 48902 ($BF06). This is the entry into the DATETIME routine. If there is no DATETIME routine installed, there is an RTS in this location.

ProDOS sees a Thunderclock in one of the slots, it sets ces a jump into the routine for you. If you want Icelender card with ProDOS, you have e it in memory each time you

and place

MODIFIED and CREATED (File Dates)

These columns contain the dates and times at which you created and last modified your files. The first half of the MODIFIED column is displayed by the CAT command; both columns are displayed by the CATALOG command. These dates and times are correct only if

- you have a Thunderclock™ or
- you have used the TIME program, described in Appendix D, or
- you have some other type of clock/calendar card, and have set it up as explained in Chapter 9.

If there is a Thunderclock interface card in one of the Apple II's slots, ProDOS recognizes the card and sets itself up to read the date and time from the card.

NDFILE (Maximum File Sizes)

FILE lists the number of bytes that each file will use if all the pace allotted to that file is filled (sometimes it is not).

E (File Properties)

lists important properties of some types of letter precedes each number in this column. The e shown in Table 3-2.

Meaning

ad Address. This is the memory address from h a binary file (BIN) was saved. The address is in hexadecimal.

Length. This is the size (in bytes) of each n a text file (TXT) or user defined file ength is in decimal.

ually placed in the same part of d. For a binary file the property in an A (for load Address) followed et binary file was last placed. Chapter 4, "BASIC Programs

Now you can instantly know the exact time your files were last updated.

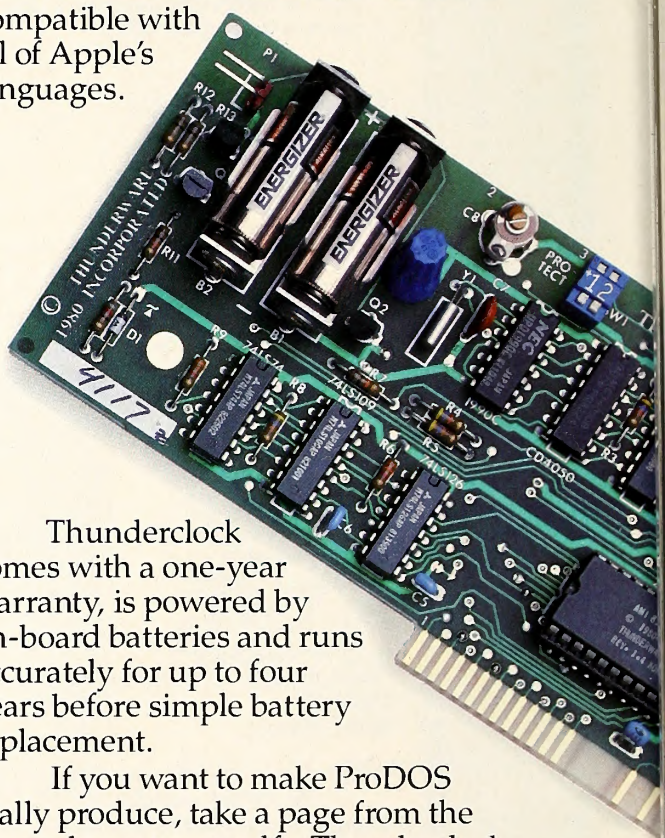
Apple could have chosen any clock for ProDOS to recognize, but they chose only one.

Thunderclock.

It's the only clock mentioned in the ProDOS manuals.

That's a nice stroke for us, but it's even better for you. Because, in addition to organizing your disk files, Thunderclock will add a new dimension to all the new ProDOS-based software. For instance, with business or communications software you can access a data base or send electronic mail automatically, when the rates are lowest. Even when you're not around. And that's just a start. The better you can use your Apple, the better you can use a Thunderclock.

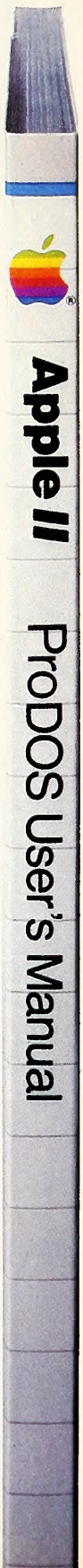
Thunderclock gives you access to the year, month, date, day-of-week, hour, minute and second. It lets you time intervals down to milliseconds and is compatible with all of Apple's languages.



Thunderclock comes with a one-year warranty, is powered by on-board batteries and runs accurately for up to four years before simple battery replacement.

If you want to make ProDOS really produce, take a page from the manual—get yourself a Thunderclock—the official ProDOS clock.

See your dealer or contact us.



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44 Hermosa Avenue, Oakland, CA 94618
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```
66  1   1:1  374    WriteLn(Output);
67  1   1:1  382
68  1   1:1  382    WriteLn(Output, 'Press <RETURN> key when
                     you are ready');
69  1   1:1  439    Write(Output,    ' to time access to PACKEDA');
70  1   1:1  478    ReadLn(Keyboard);
71  1   1:1  486    FOR I := 1 TO MaxReps DO
72  1   1:2  501      FOR J := 1 TO MaxInx DO
73  1   1:3  514        PackedA[J] := TestVal;
74  1   1:1  539    Beep;
75  1   1:1  541    WriteLn(Output);
76  1   1:1  549    WriteLn(Output, 'Test complete');
77  1   1:1  582    WriteLn(Output);
78  1   1:1  590
79  1   1:1  590    (*$R+ *) (* return to civilization — not really
80  1   1:1  590                necessary but good practice
                                nevertheless *)
81  1   1:1  590
82  1   1:1  590    WriteLn(Output, 'END OF PROGRAM');
83  1   1:0  624  END   (* TestDPack *).
```

As if we didn't need any more confusion, the execution of TestDPack yields measurements that support part of our data-packing theory, but not all of it. For instance, access to PackedA is around 55 percent *slower* than access to UnPackedA. On the other hand, according to the "byte counts" reported by the compiler for each program line, the assignment statement that accesses the PACKED structure in line 73 includes only one more byte of p-code (539−514 = 25) than the one that manipulates the unpacked ARRAY in line 62 (331−307 = 24). So, in the case of Boolean data, at least, packing degrades execution speed but doesn't bloat object code by any significant amount. It turns out that this is the norm as regards PACKED data in Apple Pascal. The designers of the compiler and p-machine arranged matters so that the compiler can generate admirably compact object code, even for those Pascal statements in your programs that manipulate PACKED data. They could do little, however, to increase the speed of access to PACKED information, except in the case of "PACKED ARRAYS OF Char."

Since the 6502 is actually a byte-oriented machine, the p-machine emulator program for the Apple was written to exploit the inherent efficiency of byte-by-byte data manipulation, despite the ostensible sixteen-bit orientation of the p-machine design. This special optimization probably would not have been possible had the Apple's own CPU not offered an eight-bit word.

Depending on the circumstances, you may judge the decrease in execution speed a reasonable price to pay for the rather spectacular saving in storage space that is realized by packing a Boolean ARRAY. After all, UnPackedA requires 160 bytes of RAM, while PackedA needs only 10. This is because each of the elements in UnPackedA is an entire word, while each element in PackedA is merely a single bit. Since there are sixteen bits in a word, each word of storage occupied by PackedA contains sixteen different elements. Consequently, UnPackedA is sixteen times larger than PackedA. Indeed, *any* unpacked ARRAY OF Boolean will be sixteen times larger than the equivalent PACKED structure.

Problems with Packed Parameters. Suppose your program declares PackedA as defined in TestDPack. What happens if you try to use PackedA[8] and PackedA[9] as actual parameters to the following function?

```
FUNCTION
   XOR(A, B: Boolean)
      :Boolean;
(* Return the value of A,
   'eXclusive-ORed' with B.
*)
BEGIN (* XOR *)
XOR := ((A OR B) AND (NOT (A AND B)));
END    (* XOR *);
```

A and B are both *value* parameters. In this case, the function call will be accepted as valid by the compiler; subsequently, the call will execute without mishap. As we've said, individual, unstructured variables may not be PACKED, so A and B each occupy the space of a whole word in RAM, while PackedA[8] and PackedA[9] each require only a single *bit*. In order to process the call, the p-machine first constructs *copies* of the values in the two ARRAY elements. Each copy, which occupies the space of a whole word, is then placed into storage reserved for the corresponding formal parameter.

Now, consider this procedure:

```
PROCEDURE
   SwitchOff(VAR Switch: Boolean);
(* Turn Switch OFF (False). *)
BEGIN (* SwitchOff *)
   Switch := False;
END   (* SwitchOff *);
```

The procedure call

```
SwitchOff(PackedA[8])
```

is not legal in Apple Pascal. Switch is declared as a VAR parameter, and the compiler will reject any call to SwitchOff involving PackedA[8] or any other element of PackedA. Recall that individual data may not be PACKED. From the point of view of the procedure, Switch refers to an individual Boolean datum. Thus, code within the procedure body assumes that Switch occupies a word of storage. But PackedA[8] occupies only a bit. In other words, whenever the actual parameter is an element of a "PACKED ARRAY OF Boolean," the procedure will access *and affect* many more bits than that occupied by the actual parameter. In this particular case, assignment to Switch within the procedure body would change not only PackedA[8] but also elements 9 through 23—a disastrous situation indeed. In order to prevent such catastrophes from occurring, the Apple Pascal compiler will not allow you to use an element or field of a PACKED structure as an actual VAR parameter.

Even though you may not pass *portions* of a PACKED structure to a subroutine through the VAR parameter mechanism, there is nothing to stop you from sending "voodoo dolls" that represent *entire* PACKED variables. In this case, there is no possibility for misunderstanding between the caller and the subroutine about the storage requirements of the actual parameter, since the formal parameter declaration in the subroutine forces the compiler to take the storage requirements into ac-

count when generating code for the subroutine body. In order to use a PACKED ARRAY or RECORD as an actual VAR parameter, however, you must declare the structure of the object as a named data type prior to the subroutine definition. We could, for example, establish our "PACKED ARRAY OF Boolean" as a named type, then rewrite SwitchOff, like so:

```
CONST
   MaxInx =        79;
TYPE
   Data =
      Boolean;
   PDA =
      PACKED ARRAY [0 .. MaxInx] OF Data;
VAR
   PackedA
      :PDA;
(* ... etc. ... *)
PROCEDURE
   SwitchOff(VAR SwitchA: PA; Inx: Integer);
(* Ver. 2: Turn SwitchA[Inx] OFF (False). *)
BEGIN (* SwitchOff *)
   SwitchA[Inx] := False;
END   (* SwitchOff *);
```

Given the above definition, the call

```
SwitchOff(PackedA, 8)
```

is acceptable to the Pascal compiler. Logically, this procedure call will yield the same results as

```
SwitchOff(PackedA[8])
```

would, were we in fact able to use single elements of PACKED ARRAYs as VAR parameters.

Notice that we are still unable to call SwitchOff using an individual element in PackedA as the parameter. Instead, we are forced to specify *two* parameters: PackedA in its entirety, as well as a number that will serve as an index into PackedA within the body of the new SwitchOff.

Nesting PACKED Objects. Pascal permits your PACKED objects to include other PACKED structures. Suppose you declare three variables A, B, and C, as follows:

```
A: ARRAY [0..5] OF PACKED ARRAY [0..5] OF Boolean;
B: PACKED ARRAY [0..5] OF ARRAY [0..5] OF Boolean;
C: PACKED ARRAY [0..5] OF PACKED ARRAY [0..5] OF Boolean;
```

The SizeOf function will report that A and C each occupy twelve bytes of RAM, while B requires seventy-two bytes. Each of the matrixes has six rows, with six elements in each row, for a total of thirty-six Boolean elements altogether. A and C use 96 bits (six words) to store these thirty-six elements, while B uses a whopping 576 bits (thirty-six words) to store the same amount of information. None of the matrixes, however, occupies only the theoretical minimum of thirty-six bits. This is because the compiler ensures that every ARRAY or RECORD occupies a whole number of *words*, whether or not the structure is packed. Thus, each row occupies an entire word, even though it contains only six Boolean elements. In each row, six of the bits represent Boolean values and ten remain unused. The same is true of the C matrix; the extra PACKED keyword at the beginning of the declaration is redundant, since the compiler will not pack the rows together any more tightly.

In matrix B, each row consists of an *unpacked* ARRAY of six elements, each of which occupies a word in RAM. Thus, each row occupies six words, or twelve bytes. Since each row already occupies a whole number of words, the six rows cannot be packed any closer together, so B occupies thirty-six words, or seventy-two bytes, altogether.

Now let's consider how packing, especially "nested packing," affects RECORD structures:

```
TYPE
   PrimaryColor =
      (Red, Yellow, Blue);
VAR
   RecA (*no packing *)
      :RECORD
         Active
            :Boolean;
         Color1, Color2
            :PrimaryColor;
         Select
            :Char;
         ColMix
         :ARRAY [PrimaryColor] OF PrimaryColor;
      END (* RecA *);
   RecB (* inner packing only *)
      :RECORD
         Active
            :Boolean;
         Color1, Color2
            :PrimaryColor;
         Select
            :Char;
         ColMix
            :PACKED ARRAY [PrimaryColor] OF PrimaryColor;
      END (* RecB *);
   RecC (* outer packing only *)
      :PACKED RECORD
         Active
            :Boolean;
         Color1, Color2
            :PrimaryColor;
         Select
            :Char;
         ColMix
            :ARRAY [PrimaryColor] OF PrimaryColor;
      END (* RecC *);
   RecD (* both inner and outer packing *)
      :PACKED RECORD
         Active
            :Boolean;
         Color1, Color2
            :PrimaryColor;
         Select
            :Char;
         ColMix
            :PACKED ARRAY [PrimaryColor] OF PrimaryColor;
      END (* RecD *);
```

Each of the RECORDs defined above is "logically equivalent" to its three siblings. That is, each can store exactly the same amount and kinds of information as the others. Yet, according to the SizeOf function, they all occupy different amounts of RAM storage. RecA needs fourteen bytes, RecB requires ten, RecC occupies eight, while RecD uses only four bytes of storage. The four RECORDs differ only in the extent to which they are PACKED.

No packing at all has been applied to RecA. Consequently, as shown in figure 2, PrimaryColor, Boolean, and Char fields occupy one word each. Also, each element of the ColMix ARRAY occupies one word. RecA contains four individual fields and one ARRAY of three elements;

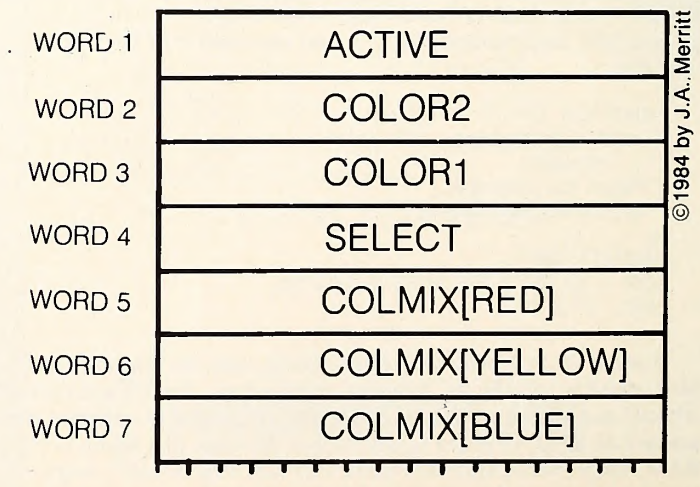

Figure 2. RecA organization in RAM.

it therefore occupies a grand total of seven words, or fourteen bytes.

RecB is an unpacked RECORD, but its embedded ARRAY is PACKED. Refer to figure 3. Each of the four individual fields requires one word of storage, but packing has reduced the size of the ARRAY to just a single word. This is because any of PrimaryColor's three values may be represented with only two bits. Therefore, the ARRAY requires only six bits of storage, but since all RECORDs and ARRAYs must occupy a whole number of words, an entire word is allocated to MixCol. Since it includes four one-word fields and a single-word ARRAY, RecB requires five words, or ten bytes, of RAM.

For RecC, which is illustrated in figure 4, the RECORD itself is PACKED, but the MixCol ARRAY is unpacked. We've already seen that the unpacked ARRAY occupies three words (six bytes). Obviously, then, the four individual fields, when PACKED, can be squeezed into a single word. The Boolean field Active needs only a single bit, the two PrimaryColor fields may be represented by four bits (two bits each), and the Char field, Select, fits snugly into eight bits. Thus, the four individual fields together occupy only thirteen bits. The compiler wastes three bits by allocating a single word to hold all four fields.

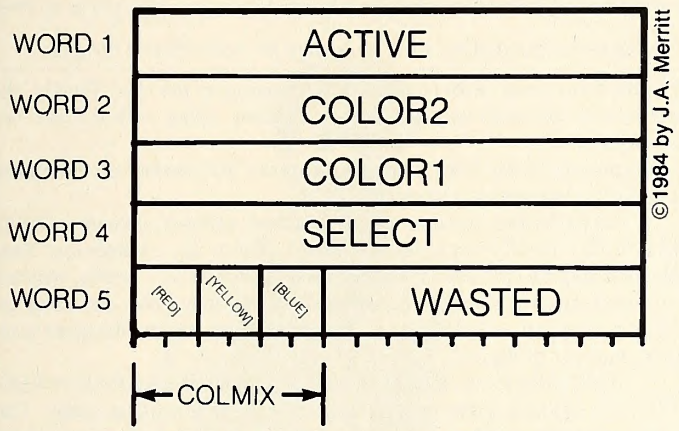

Figure 3. RecB organization in RAM.

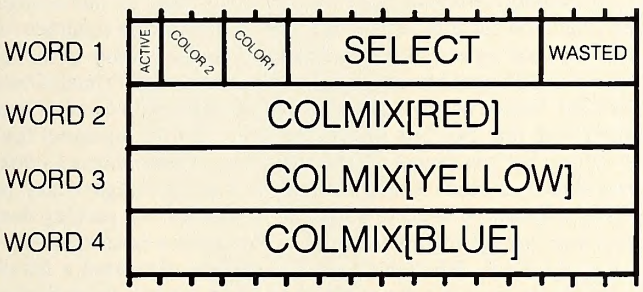

Figure 4. RecC organization in RAM.

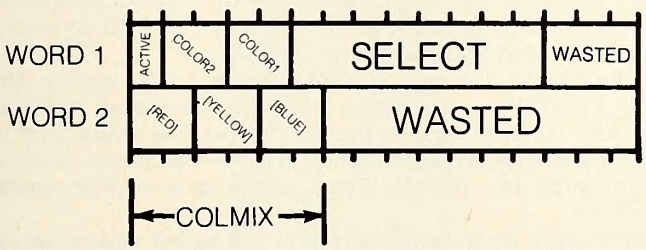

Figure 5. RecD organization in RAM.

Finally, we realize the greatest space savings of all by packing RecD along with its embedded ARRAY. Figure 5 shows the logical structure of this RECORD. We've seen how the four individual fields, when PACKED, occupy only a single word. We also know that the ARRAY MixCol can be squeezed into one word. Thus, RecD needs only two words, or four bytes, of RAM.

Wasted Days and Wasted Bytes. Consider the following declarations:

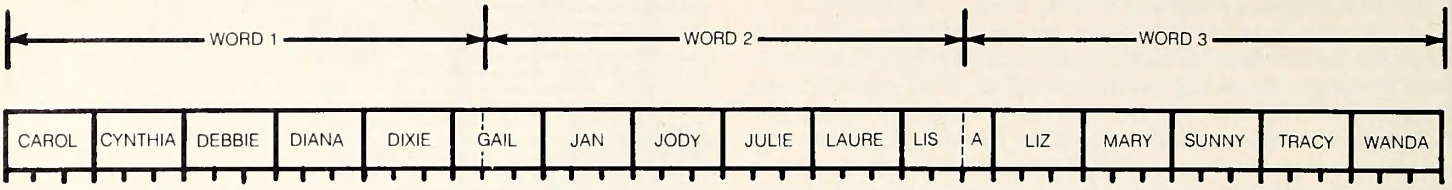

Figure 6. Theoretical (ideal) LaundryDay array.


```
TYPE
  Housemates = (* it's a BIG house! *)
    (Carol,   Cynthia,  Debbie,  Diana,  Dixie,
     Gail,    Jan,      Jody,    Julie,  Laure,
     Lisa,    Liz,      Mary,    Sunny,  Tracy,
     Wanda
    );
  Day =
    (Monday, Tuesday, Wednesday, Thursday, Friday, Saturday,
     Sunday);
LaundryDay =
  PACKED ARRAY [Housemates] OF Day;
  (* LaundryDay[H] records the day of the week when
     Housemate H does her laundry.
  *)
```

Bearing in mind all the data-packing principles we have explored so far, you might think that a LaundryDay variable occupies exactly three words (six bytes). Clearly, the ARRAY contains sixteen elements, and three bits are the minimum necessary to store a value of type Day. (Of course, three bits can actually represent up to *eight* values, and DAY includes only seven, but two bits can handle only four or fewer values, so we do indeed need the third bit in order to represent all possible Days.) Sixteen (the number of elements) times three (the minimum number of bits per element) is forty-eight. In an ideal world, exactly forty-eight bits (or three sixteen-bit words) are needed to store a variable of type LaundryDay. However, SizeOf(LaundryDay) is eight, implying that *four* words are actually necessary. Again, the realities of the Apple Pascal system design, and its optimizations, contradict our developing theory of its data-packing strategy.

Suppose that a LaundryDay variable *did* occupy just three words, as shown in figure 6; that is, suppose that it were "perfectly" PACKED. In that case, the first word would completely contain the elements indexed from Carol to Dixie. The element with index Gail would lie partially in the first word and partially in the second. The elements indexed from Jan to Laure would be contained entirely within the second word, but the element with index Lisa would straddle the second and third words. All the remaining elements, indexed from Liz through Wanda, would fit in the third word.

In order to access either the Gail or Lisa elements of the "perfectly" PACKED ARRAY, the p-code version of your program must know to extract bits from two separate words. To access any of the other elements, however, only one storage word must be fetched. Given an ARRAY reference such as LD[H], where LD is a "perfectly" PACKED variable of type LaundryDay and H is an expression of type Housemates, your program would need to spend time checking the value of the index expression, H, in order to determine whether the element being referenced was one of the "straddlers." If the LaundryDay variable was not accessed very often, the overall delay caused by the close examination of the index value would be slight. But what if the ARRAY were to be accessed thousands—or maybe tens of thousands—of times during the execution of your program? This extra index checking would cause a noticeable degradation in execution speed.

As we've said, the p-machine is most comfortable grabbing a single sixteen-bit word at a time. For reasons of convenience and speed, it would be best if any item in a PACKED ARRAY of elementary or enumerated values could be isolated after fetching just one storage word. In fact, the compiler assures this state of affairs by not allowing elements to overlap word boundaries. Thus, in an *actual* LaundryDay variable, as shown in figure 7, only the Carol through Dixie elements are contained in the first word; one bit at the end of the word remains unused. Similarly, the second word contains the Gail through Laure elements, and again one bit is wasted. The Lisa through Tracy elements are contained entirely in the third word, with an unused bit bringing up the rear. Finally, the fourth word contains only the Wanda element, along with thirteen unused bits.

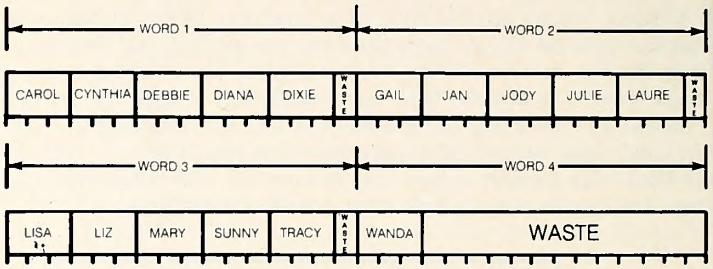

Figure 7. LaundryDay array as packed by Apple Pascal compiler.

Summary. Four brief principles express the essence of the Pascal compiler's data-packing strategy:

1. An individual variable, or an unpacked ARRAY element or RECORD field, usually occupies one word. There are exceptions. Real variables require two words; Strings need (n DIV 2) + 1 words, where n is the maximum number of characters the string may hold; and Long Integers occupy ((n + 3) DIV 4) + 2 words, where n is the declared maximum number of digits.

2. If allocated as an element or field of a PACKED ARRAY or RECORD, any object is given only as much storage as it actually needs. This is the minimum number of bits necessary to represent all values of the associated data type. For instance, the Boolean type includes only two values, so the entire Boolean range may be represented by just a single bit. The Char type contains 256 distinct values, requiring a minimum of eight bits. At least sixteen bits are necessary to represent any of the Integer type's 65,536 possible values. The enumerated type PrimaryColor includes three values, so any value of this type must be allocated at least two bits. (Note that two bits may actually be used to represent four distinct values, but you cannot represent any one of three distinct values with less than two bits.) Reals, Strings, and Long Integers may be declared as elements or fields of PACKED structures, but packing does not affect their storage requirements; such data cannot be condensed.

3. Any ARRAY, RECORD, or SET will be allocated a whole number of words, even if some of the bits remain unused. In particular, a SET will *always* be given (n DIV 16) + 1 words, where n is the largest number of values that the SET can hold. An ARRAY or RECORD that is part of a PACKED structure will not itself be PACKED unless the PACKED keyword is applied to it specifically.

4. An ARRAY element or RECORD field that is not itself an ARRAY or RECORD may never begin within one word and end within another. Any "normal" (that is, unstructured) item that would begin in word A and overlap into word B, for instance, is repositioned so that it will begin at the start of word B instead, leaving one or more bits unused in word A.

For Further Study. Our discussion of packing has concentrated on methods and formulas that you can use in determining the amount of space that will be occupied in RAM by PACKED and unpacked data objects. We have not, however, examined the particular physical *arrangement* of fields within that space; nor will we. This thorny issue is quite properly the concern of only the most dedicated (and fearless) programmers. If you fit that description, you will find a wealth of relevant information in chapter 6 of the recently published *Apple III Pascal Technical Reference Manual*. Though the manual officially covers only the Apple III implementation of Pascal, its explanation of the compiler's storage optimization strategy (the so-called "packing algorithm") applies equally well to Pascal for all of Apple's 6502-based computer systems. ■

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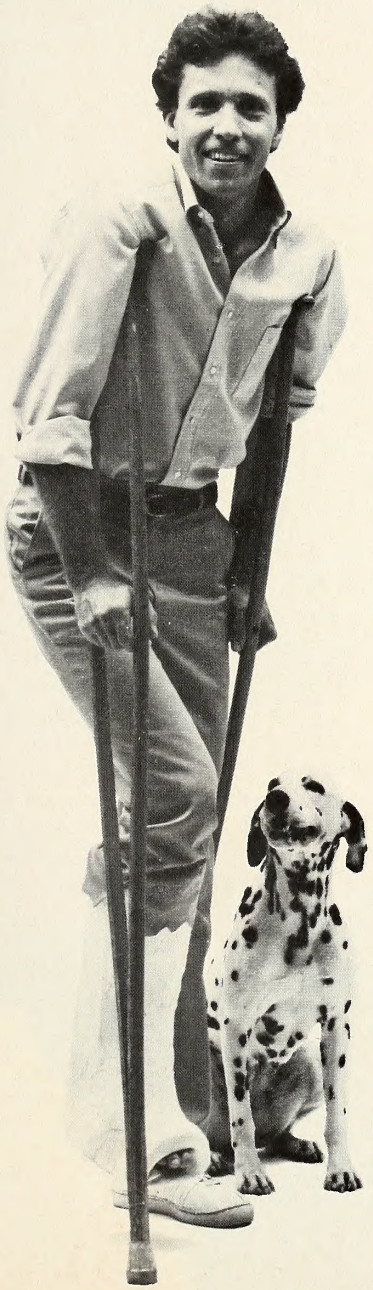

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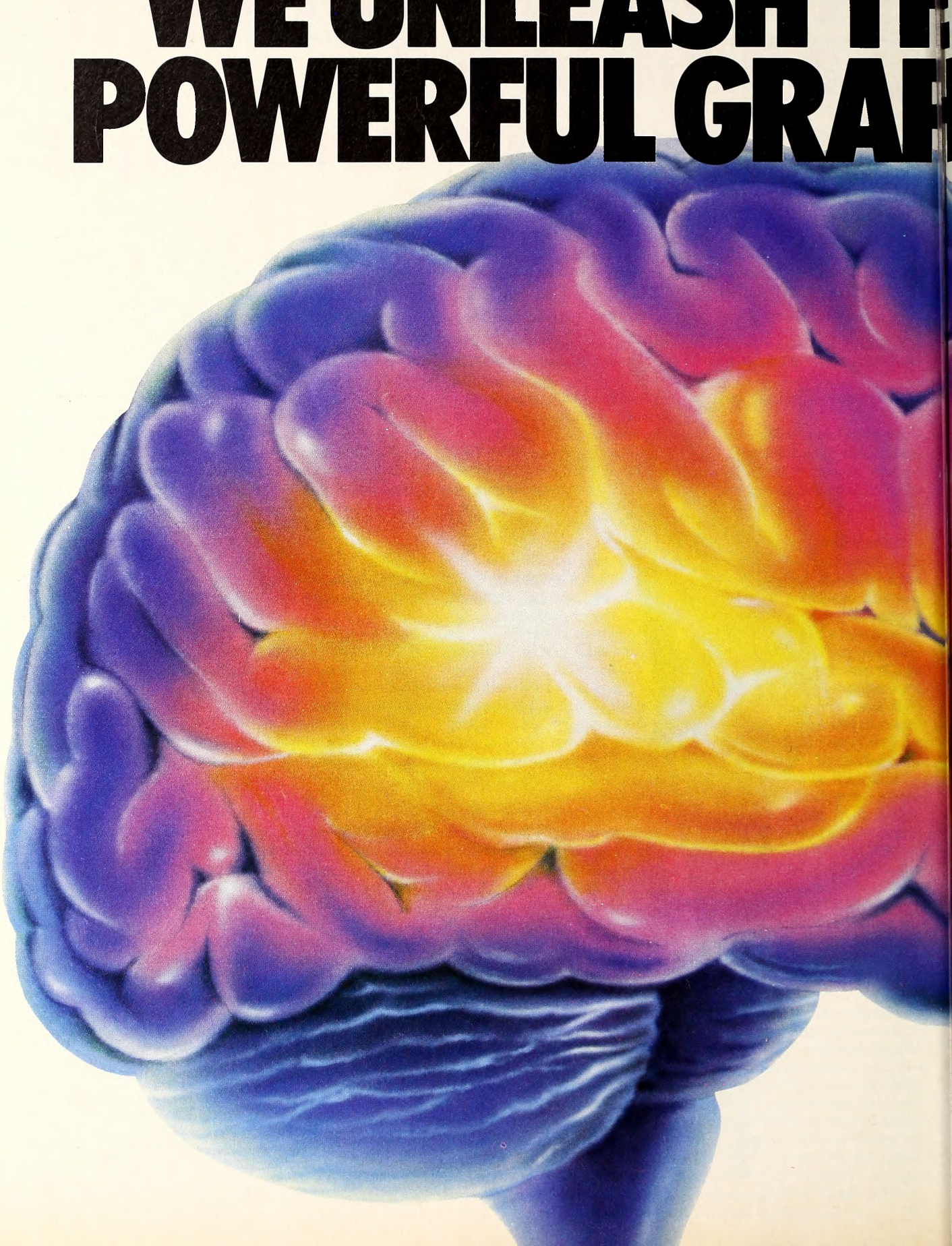

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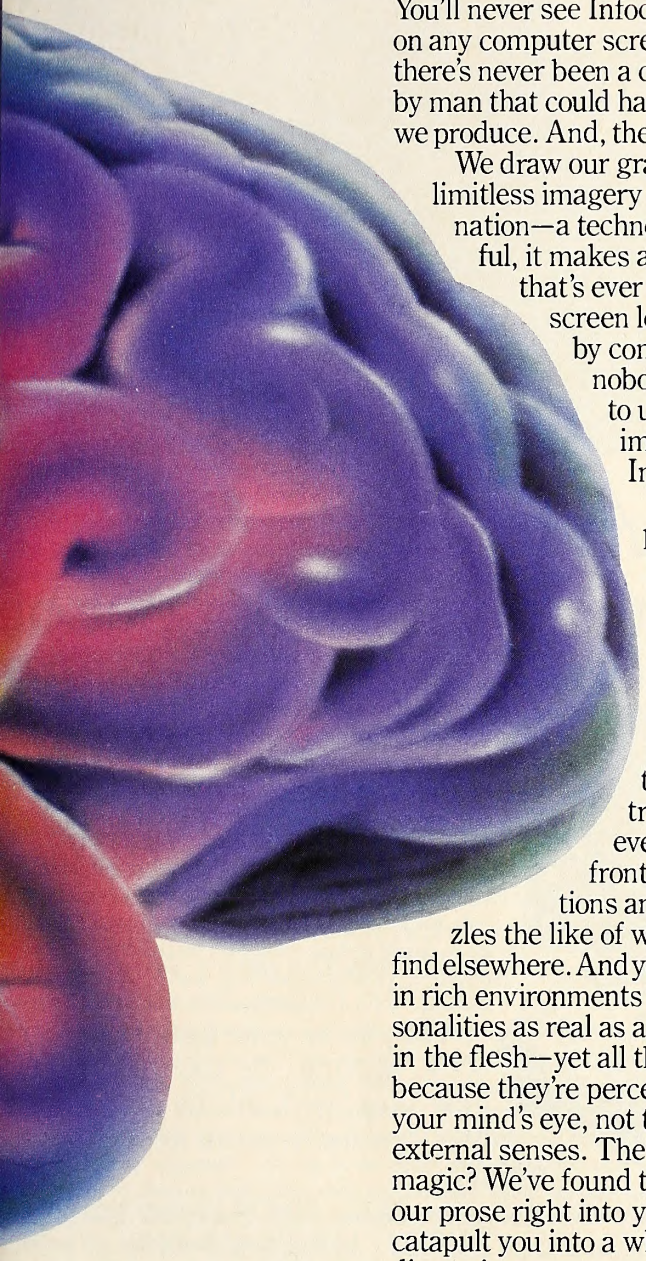

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NOVATION

Teletellers, Money, and Modems

A news reporter sends a story to his paper by modem. He could have done this by other means (mail, express courier, in person), but the modem lets him do it immediately.

Apple hobbyists "meet" on CompuServe to have a conference with Steve Wozniak. They could have met in person, but that would have meant everyone coming from different parts of the country.

Modems do for computers what telephones, radio, and television do for people—help them communicate. Modems don't let us do anything we couldn't do before; they just let us do things easier and faster (anyone who has gotten lost in a terminal program's documentation might disagree).

Institutions that could take advantage of modem-equipped home computers include banks, supermarkets, and post offices—places where standing in line is often unavoidable.

This time we'll look at banking by home computer. We'll also get acquainted with a feature on The Source for those looking for someone to argue with. All that will be followed by a surprise for anyone who became angry or confused because of January's column.

Citi Chase. Chase Manhattan and Citibank entered the area of home banking first, followed by Bank of America. Chase Manhattan began its operation in the spring of 1981, and Citibank hit the scene about eighteen months later in late 1982. Despite their early starts, both Chase Manhattan and Citibank are still in the testing phase of operation. Bank of America's system, which operates primarily in northern California, is functional and open to customers.

Chase's Home Banking requires that customers have a set of two disks provided by Chase and that transactions be prepared off-line before calling the bank. Once that's taken care of, dialing into the bank is done from within the Home Banking program. The program calls the bank, logs on, performs all transactions, logs off, and then tells the customer if there are any messages waiting to be read. Messages and account balances are written to disk after each call, but because transactions made during a call aren't always processed immediately, balances don't always reflect the true status of an account.

Like Chase's system, Citibank's HomeBase also requires a disk—one of two provided by the bank—for logging on to the system, but after that's done, the customer performs all transactions while on-line. HomeBase processes the transactions the user makes on-line, and balance inquiries reflect those transactions. So a person could find out how much money is in his checking account before figuring out how much to transfer to another account, such as a savings account. After the transfer, a balance inquiry would show the new balances for the checking and savings accounts.

Bank of America's HomeBanking is available to users of any computer, because unlike the other services HomeBanking doesn't require the customer to use any special software. All that's needed is a computer and a modem. Customers log on through their local CompuServe number and then perform transactions on-line the same way HomeBase customers do. (Note: Bank of America customers log on through CompuServe but don't have access to CompuServe itself.)

Chase's system, having the user prepare everything ahead of time and letting the program do all the work, is sort of like using a terminal program's macros. It's organized and quick. The approach Citibank and Bank of America favor is more casual—make it up as you go along, the way you'd peruse a BBS.

Checks? We Don't Need No Stinkin' Checks. Paying bills is probably the most useful feature of banking from home. For all three services, customers must select, at the time they sign up, which payees they would like to pay by home banking. Payees include oil companies, utility services, credit unions, credit card accounts, department stores, hospitals, insurance companies, and just about any other party you'd expect to pay on a somewhat regular basis.

Making payments is simple; just select the payee, the amount to be paid, and the time the payment should be made. Chase Manhattan and Citibank allow payments to be scheduled up to a year in advance, while Bank of America allows you to schedule only thirty days into the future. Of course, payments scheduled for the future can always be changed or canceled if necessary. Adding to the list of payees must be done by mail for Chase Manhattan and Bank of America; Citibank lets you add new payees and pay them while on-line.

All three banks pay the payees on bank checks with your name and account number on them; because they're bank checks, they're not included in the monthly statement with the rest of your checks. Chase Manhattan lists payments made through home banking on the monthly statement. Bank of America lists payments of customers' monthly statements, and it also shows them on the electronic statement, which can be viewed while on-line. The electronic statement has all the information a normal monthly statement would have: which checks have cleared, credits and debits, automated teller transactions, all transactions made for the past thirty days, and, of course, current balance.

Getting an on-line account statement is next to impossible on Chase's system. You're allowed to look at only those transactions made since the last time you were on the system. The information scrolls by, and the only way to keep it is by printing it out as it comes in.

Citibank's method of showing HomeBase payments is the most elaborate, listing transactions on the regular checking account statement and sending each customer a bill payment budget report as well. The report shows payees, their status (active or deleted), customer's account number for each, amount that was paid during the month, and year-to-date amount paid to each payee. In addition, while on-line, customers can

…s made during the past sixty days.
…d. One thing you can't do while banking by home …drawals; you still have to go to the bank to do that.
…s you do the next best thing. HomeBase lets cus… checks, which are delivered by mail with one sig… one (remember, it takes two identical signatures … check, and identification is required).

A handy feature that all three systems offer is electronic mail. It's through electronic mail that customers can get in touch with home banking officers who answer questions, most of which are related to account service. There isn't any information you can get through electronic mail that you can't get by walking into the bank or calling up and asking; but electronic mail means you don't have to wait while someone contacts the supervisor or shuffles you around to someone else.

Stickup at 300 Baud. Like other banking matters, security becomes questionable when a bank's computer is accessible from the outside. And the publicity of computer crime over the last ten months only brings the question of security more to the forefront.

By making software necessary for log-ons, Chase and Citibank have partially solved the problem. Another lock on Chase's system is the requirement of a password before the system will run. Citibank requires the numbers of the customer's automated teller card and personal identification code, while Bank of America requires just a pass code.

In most ways, bank customers' money is no less safe than it was before the introduction of home banking. Chase and Citibank take the same precautions here as they have with automated tellers. Bank of America doesn't require callers to its system to use the bank's software to log on, but guessing at pass codes won't work for someone trying to break into the system. After a few attempts to enter a pass code have been made, the bank's computer will prevent anybody (the customer included) from getting access to the account. The valid customer must come into the bank to clear matters up.

How secure a customer's money is depends on precautions taken by the bank as well as by the customer. Anyone who can memorize a password or personal identification number (such as that needed to use an automated teller) shouldn't have to worry too much about security. None of the three banks has reported any problems with mischievous callers.

No On-Line before Its Time. Until a few years ago, banking from the home was available only through services other than the bank. Now, videotex companies offer it, and CompuServe offers it. Chase Manhattan and Citibank, which began testing their home banking systems a few years ago, are still testing.

Customers who already do their banking through videotex or CompuServe should compare what the bank charges for home access to the amount of money spent doing banking by an alternative source. At CompuServe's nonprime-time rate of $5 an hour, it looks like customers who bank through CompuServe would be better off sticking to it, unless the bank offers exclusive services that CompuServe cannot. For example, Citibank, which charges $10 a month, throws in news and current and past stock market quotes from Dow Jones News/Retrieval.

Banking from the home is only one example of computers shrinking our world. It's hard to imagine a world in which everything (yes, *everything*) is done from the chair in front of a home computer. Working that way some of the time is convenient; the notion of working from a home computer all of the time is scary.

Comments are invited care of this column.

And Now, Here's the News. Participate is a conferencing system on The Source that offers what it calls interactive journalism; actually, that term is a little misleading. Participate isn't interactive journalism in the sense of seeing a news story by Ted Koppel or Dan Rather and then giving them your opinions; it's more like having a forum discussion with fellow viewers.

Participate is licensed to The Source from Winchester, Massachusetts-based Participation Systems, which has licensed in-house versions of Participate to educational institutions, hardware vendors, and various corporations for private use. The Source's version is open to the public.

To get into Participate, callers just type *parti* at the command level and respond to menu prompts the rest of the way. Currently, topics of discussion include Apple's Macintosh versus IBM's PC*jr*, politics,

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computer-aided instruction, Apple's stock ("battered or bolstered?"), teleconsulting, and MCI's venture into electronic mail.

You, Too, Can Be a Moderator. Anyone can start a conference, and the structure of the conference is up to the one who originates it. After seeing the original message, participants choose whether or not they want to join the discussion. If they join, they can send comments back to the originator and receive a reply.

A person who originates a conference has the option of doing so in a message format or a topic format. A message format means that what the originator has to say will be sent to specific individuals. Discussion in the message format is on a one-to-one basis between each individual and the originator. In this format, Participate works much the way private mail works on BBSs.

The Source's version uses the topic format. A message is posted for the general public, and then the originator has the option of making it so that participants can communicate with the originator, among themselves, or with the originator and each other.

Electronic debate isn't new to telecommunications; Participate was started on The Source a long time ago, and Conference Tree BBSs have been doing it for several years, albeit in a different way. Conference Tree is structured in a tree format, with various topics sprouting branches, and each branch sprouting its own subbranches.

Participate is set up more the way people meet in person. A topic of discussion is given, and participants communicate either with the entire group at a time or on a one-to-one basis.

Calling Participate "interactive journalism" isn't accurate. Whether Participate would succeed with hard news as its topics isn't clear. Granted, hard news such as Middle East events, politics, economic policies, and other controversial matters would work wonderfully as subjects for discussion on Participate. But how interesting they are to a microcomputer audience is open to question, based on the topics currently listed in The Source's Participate.

It's still fun, though.

Whoops! Department. In January we said that an Apple using *ASCII Express: The Professional* could exchange files error-free only with another Apple similarly equipped.

That's not true.

It's not even close. As a matter of fact, it was a lie. Not an intentional lie, but a lie nonetheless. It wasn't meant to misinform. It wasn't *meant* to do anything. It was just there. Somehow.

We don't know what happened, whether it was the hysteria of working during the Thanksgiving weekend or the beverages with a third less calories. What we meant to say was that computers using the same *protocols* could exchange information error-free; two Apples with two *AE Pros* was just an example. *AE Pro* uses the popular Christensen protocol, which means verified file transfer is possible among *AE Pro*, *Z-Term*, *P-Term*, *Modem* (the first microcomputer program to use an error-checking protocol), *PC-Talk*, and other programs that use the Christensen protocol.

AE Pro is used a lot in examples here, but that doesn't mean we're biased toward it. Because *AE Pro* was the first communications program to implement the Christensen protocol under DOS, and because DOS is more or less the Apple II's "first" operating system, *AE Pro* is what we often use to illustrate things. Apparently, it got a bit out of hand last January. Not too pro.

It also wasn't our intention to imply that the *Microcom Networking Protocol* is going to be the standard protocol in the future (read carefully, folks), but rather that a standard is needed and Microcom and Communications Research Group are trying to set the standard with *MNP* and *Blast* respectively.

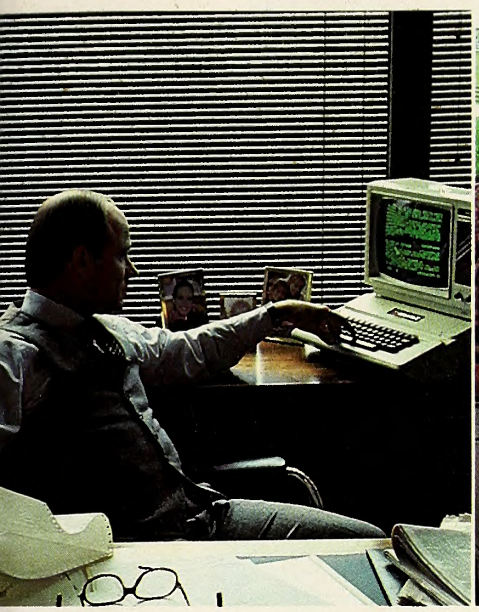
Softalk endorses neither one (but that doesn't mean they're not good products).

Now, That's a Standard! As for setting industry standards, the Christensen protocol is about six years old and was implemented on mainframes only *after* it became a success in the micro community; that says a lot for the Christensen protocol.

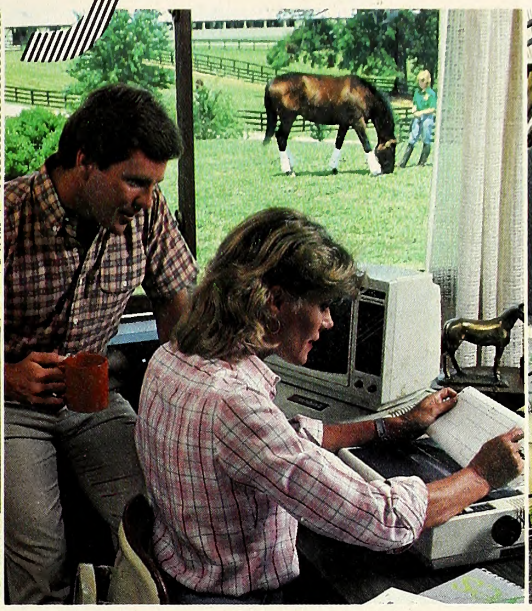
It's sort of like the way IBM got into the microcomputer market *after* Apple proved it to be a lucrative one. Innovators aren't always perceived as setting industry standards, but they're the ones who are breaking the original ground. ■

Hayes

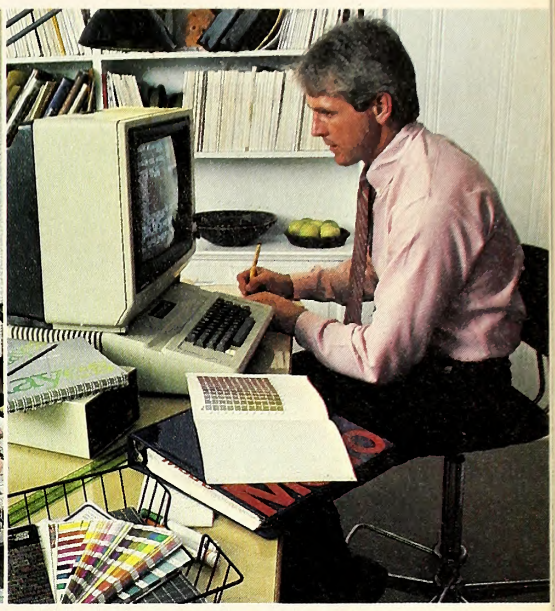
Your Apple's telephone.



"Thanks for the prompt reply. Sure was a lot faster than waiting for the mail!"



"Gary: The pedigrees for next week's auction are as follows..."



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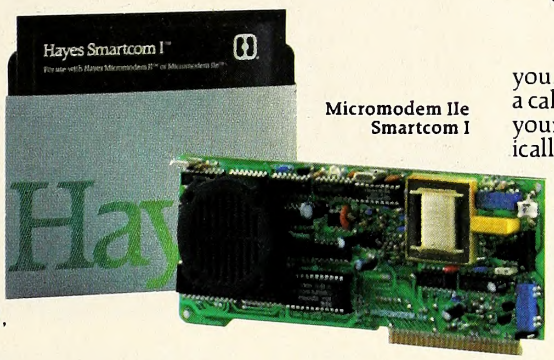

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"A human being is a part of the whole, called by us the 'universe,' a part limited in time and space. He experiences himself, his thoughts and feelings as something separated from the rest—a kind of optical delusion of his consciousness. This delusion is a kind of prison for us, restricting us to our personal desires and to affection for a few persons nearest to us. Our task must be to free ourselves from this prison by widening our circle of compassion to embrace all living creatures and the whole of nature in its beauty."

—Albert Einstein, *New York Post*, November 28, 1972

"The time has arrived in which we have to realize we are all parts of a single living being and develop new kinds of responses and relationships."

—Orest Bedrij, "The Grand Unification of Physics"

Without question, future generations will recall the Twentieth Century as a triumphant age of pure physics. They may forget the Beatles, Richard Nixon, Apple Computer, and the New Deal. But our descendants will not easily forget the achievements of men like Rutherford, Bohr, Einstein, Dirac, de Broglie, Fermi, Hahn, Schrödinger, Planck, and Heisenberg.

The legacy of this triumphant age is greater than many of us probably realize. The semiconducting circuits in all the computers that we take for granted today could not have been created without knowledge of electrons and electron currents. Few physicists of stature actually worked on the design of computers, but it was their pure research that made this technological boon possible.

Breakthroughs in physics were also directly responsible for advances in crystallography (the study of the geography of atoms). With the development of x-ray crystallography, it was only a matter of time before the structure of DNA was determined.

Little Big Universe. Results form physicists' microcosmic discoveries have directly affected our knowledge of the nature of the universe. Having an understanding of the behavior of subatomic particles may help us discover why the universe is the way it is. And vice versa.

Perhaps the most difficult legacy that we've all had to live with is the discovery of nuclear fusion. Physicists themselves realized that they were unleashing powerful forces on the world—forces that could be used for good and evil, for creating and destroying.

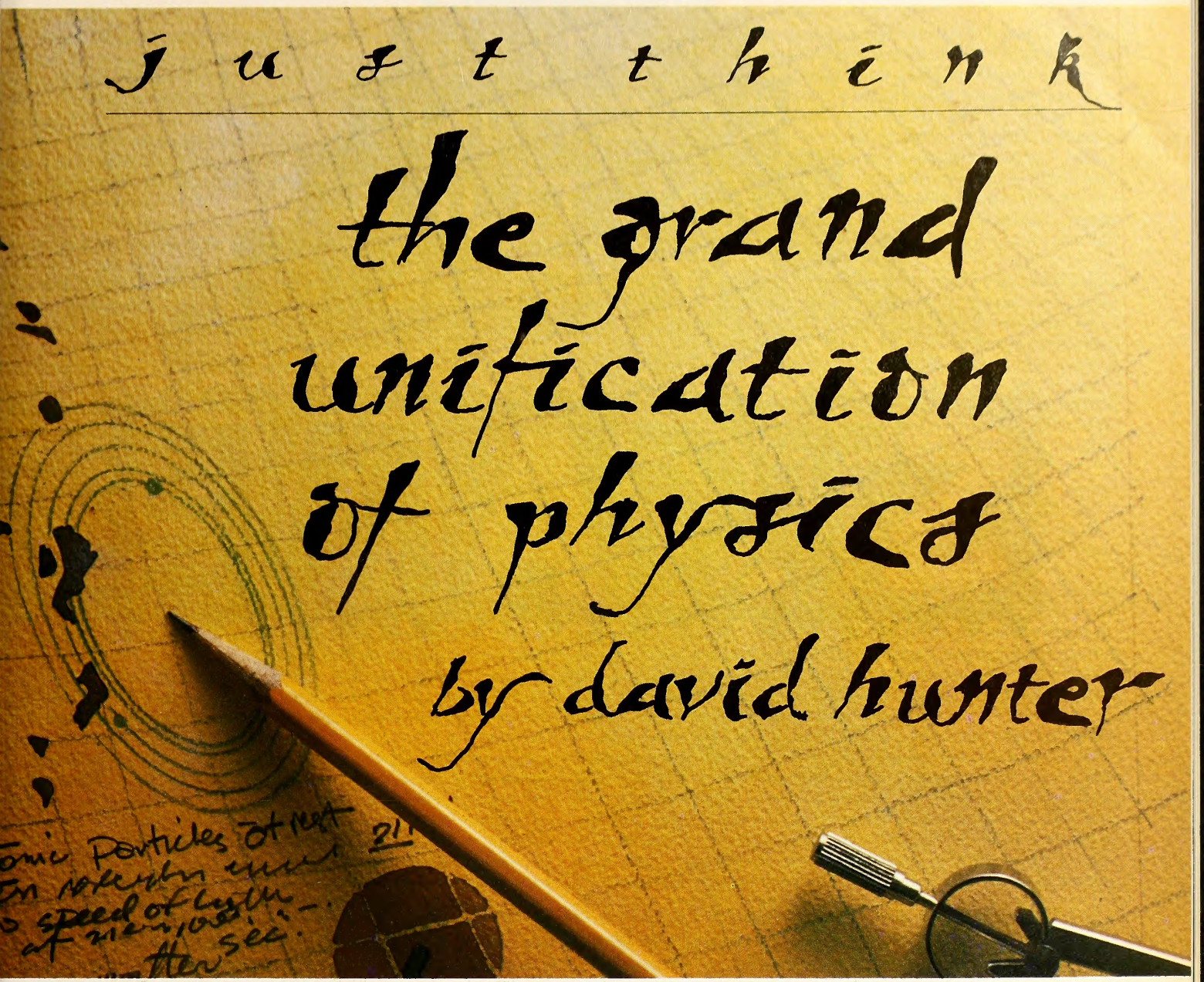
The push to realize advances in computer circuits and nuclear chain reactions was directly involved with our overall efforts in World War II. Computers were for keeping deadly secrets; nuclear reactions were for killing the enemy. It was only when the spread of fascism was halted, and the world returned to peace, that these technologies turned toward more benevolent pastimes.

Today, only a few would argue that computers are a negative aspect of human existence. Most would argue the opposite. Where would we be without computers? The case for nuclear fusion is not so agreeable. In

just think

the grand unification of physics

by david hunter



the late forties, we could devastate a small country. Today, we have the means to exterminate all life on this planet.

And yet, tucked back there behind all the megaton hydrogen bombs is the promise of a fusion reactor. If we learn how to control a hydrogen fusion reaction (the same reaction that drives the sun) in a safe and economical way, we may never want for energy again. Never, of course, is presumptuous. The fuel for a fusion reactor would come from the oceans of the earth. Shall we say "until the oceans dry up."

Likewise, the jury is still out on computers. Physicists are constantly increasing our knowledge of other kinds of semiconducting materials, such as gallium arsenide. It's safe to say that our descendants will live with computers so much more sophisticated and powerful than the best we have today that we can't even imagine them.

Dual Legacy. The harvest (and the potential horrors) that will be reaped from our experiments with DNA and genetic engineering—the ability to alter the basis of life—may have the most profound effect of all. We may have trouble recognizing our descendants, let alone understanding their tools.

For us, the excitement is the fact that there are still sixteen years left to this triumphant century of pure physics. In the universities, government laboratories, and private companies are men and women striving to understand the deepest mysteries of our universe. One such person and his achievements are the subjects of this article.

Just think if it were possible to fathom all the diverse causes and effects of our universe. We would know the reason for all the phenomena of the cosmos and microcosmos. The question of whether this knowledge would increase or decrease our ability to control our destinies is a tricky one. Surely our ability to understand and combat disease would increase. Although knowing how and why a comet is headed on a collision course with the earth may not help us to avoid a natural apocalypse, perhaps—from our position of complete knowledge—we would know how to divert that comet so it falls into the sun (knowing, of course, the effects resultant from a comet crashing into the sun).

It has been said by some very knowledgeable scientists that the universe, on the whole, may be weirder than we can ever understand. Etymologically, this conclusion seems to imply that fate or some unfathomable force of destiny is ultimately the referee of the cosmic playing field we call the universe. This conclusion also implies that there are kinds of knowledge, or comprehension, that we cannot transcend. As it turns out, the weirder-than-we-can-understand picture of the universe is a minority view among scientists.

What you are about to read, the first of *Softalk*'s Just Think articles, examines one man's attempt to identify the underlying laws that govern our lives. It takes the form of the unification of physics, but it implies much more. Just think of a universe where everything is connected to everything else on a fantastically deep level. Just think if you were brothers and sisters to everyone on the earth in a fundamental way, far removed from color of skin or ideology. It sounds like George Lucas's

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Force, right?

In the year 1984, it is our privilege to report that the bombs aren't falling, the superdiseases aren't plaguing us, and the computers aren't piping the Newspeak of Big Brother and his Party. And no Darth Vaders, souls consumed by the Dark Side of the Force, are rampaging through our galaxy.

We are still emerging from the egg. Our existence is fragile (when has it been otherwise?) and some of us live in dread, but the minds of men are never at rest. The more truth we discover, the more good we'll eventually uncover.

Unified Thinking. It is an old dream of humankind's great thinkers to discover and document the ultimate force in the cosmos—whether it be nature, the law of God, or something else. In the course of time, these thinkers have come to many different conclusions. Alchemists searched for the philosopher's stone—a single substance or chemical preparation that would transform the baser metals into gold. John Milton searched for a means to "justify the ways of God to man." And modern-day physicists search for the "grand unification of physics."

Soon after finishing his masterful theory of general relativity, Albert Einstein embarked on a project that would occupy him for the rest of his life. Einstein felt strongly that there was a unifying force in existence that has so far eluded our discovery. The man who had so brilliantly described the forces that affect the movement of large bodies in the universe could not accept the idea that ultimately we live in an unpredictable universe subject to more or less random phenomena. He said once to Niels Bohr, the father of quantum mechanics, "God doesn't play at dice."

Beginning his search for what he called a "unified field theory," Einstein attempted to marry the forces of gravity with the forces of electromagnetism. (A field is a region or space in which a given effect, such as magnetism, exists.) He wrote in *Nature*, "The conceptual foundations of the (General) Theory have no relations with the electromagnetic field. These facts suggest the following question. Is it not possible to generalize the mathematical foundations of the theory in such a way that we can derive from them not only the properties of the gravitational field, but also those of the electromagnetic field?"

The Cosmic Shoot-Out. Einstein published several papers on unified field theories, all based on generalizations of his theory of the metric field. Most physicists remained skeptical. Einstein sought to give not only an explanation of the existence of the proton and the electron but also of all the results usually described by quantum mechanics (the general mathematical theory dealing with the interactions of matter and radiation in terms of observable quantities only). The skeptics argued that other elementary particles (neutron, different mesons, hyperons, and so on) are unstable and disintegrate like radioactive atoms into other particles. Quantum theory associates with each of these a type of field, and a unified field theory ought to embrace them all.

Though he failed to formulate a theory that would cover all the forces of nature at once, Einstein is due the credit for having insisted on the importance of the problem. This forty-year detour on the part of Einstein in no way changes the fact that he was the greatest scientific mind since Newton, and possibly of all time.

In the years following Einstein's death, the search for a unified field theory has intensified. Many physicists today are striving for a theory, a single mathematical expression, that would encompass all the phenomena of gravitation, electromagnetism, and the strong and weak forces of the subatomic worlds. (The strong force binds neutrons and protons together to form atomic nuclei and the weak force causes certain particles to decay.) It has been proven to just about everyone's satisfaction that the electromagnetic and weak forces are different aspects of a single electroweak interaction.

The next step in the process, which has been proposed in several Grand Unification Theories (GUTs), is to incorporate the strong force. The problem is that these theories are currently unprovable. The energies at which the strong and electroweak forces should merge—10^{24} electron volts—are far higher than current particle accelerators can generate.

While most physicists struggle with a more or less conventional method of formulating a GUT, there are numerous nonclassical, nontraditional approaches, some of which are decidedly frowned upon by the supercritical physics community. Respected Nobel laureates, like Steven Weinberg, maintain that it will take from one hundred to two hundred years to get all the answers.

Right now, there are theories of such phenomena as supergravity, implicate order universes, and a host of others. Many theoretical physicists are working closely with astrophysicists trying to understand the implications of the big bang theory, often revealing heretofore unknown aspects of how and why particles behave the way they do. The late C.P. Snow once said that "science is an edifice. To put in a brick, a scientist has to climb on the shoulders of other men, often greater men." Today, the search for a unifying scheme in nature seems at times like a mad scramble up steps formed of past achievements. But it is best to remember more of Snow's thoughts on the subject: "Individuals, except for the odd anomaly who occurs once in a hundred years, don't count all that much."

For Snow, the scientific experience is one that is very often sought out for the aesthetic joy and satisfaction it offers. Beyond the ultimate question of the scientist's responsibility to society (or applications of scientific breakthroughs), in the Snowian scheme of things the intellectual stimulation that accompanies scientific investigation is usually a raison d'être.

GUT Feeling. When one reads Orest Bedrij's "The Grand Unification of Physics," the "aesthetic joy" rubs off a bit on the reader. This intriguing theoretical presentation, which is unpublished, is not a traditional GUT, nor does it follow any specific trend started elsewhere.

What Bedrij has done that's different is use mathematics to support his theories. "Usually people come up with a model," says Bedrij, a native of the Ukraine. "We don't have a model that claims to be what reality looks like. We've done a very dry unification." Dry? Yes. Unexciting? No way.

Bedrij's credentials are impressive. At twenty-nine he was the IBM technical director at the Jet Propulsion Laboratory of the California Institute of Technology. There he was responsible for the development, programming, and integration of the computers that controlled the first soft landing on the moon. He received his bachelor of science in electrical engineering from the Rochester Institute of Technology in 1956 and has been a United States citizen since 1955.

In a twelve-year stint at IBM, Bedrij held various engineering and management positions, involving the planning and development of the IBM "Stretch" system, the IBM 1410 computer system, and the IBM 360 computer system. In 1968 he left IBM and founded Advanced Memory (later called Intersil), which pioneered the development of LSI (large scale integrated chips) technology and computer memory systems. In 1977, after seven years of intensive research, he wrote the book *ONE*. The book deals with the unity of nature and lays down some of the concepts that emerge in "The Grand Unification of Physics."

In the preface to "The Grand Unification of Physics," Bedrij claims that the work achieves "a faint glimpse into the much awaited Grand Unification Theory," that it is a "fundamental tool for verification of the long known truth of the unity of all."

Graduating Boxes. Bedrij begins his paper with five statements that are the essence of his grand unifying scheme: Physics as a verification tool "brings alive the structural principle of basic harmony, simplicity, and fundamental order underlying the diversity of nature"; "As fundamental laws assume simpler form, the unfolding picture of existence becomes more removed from experience"; "In the universal theater, the complex, interrelated quantities of gravity, electromagnetism, matter, and energy are really the same essence in different amounts"; conventional data supports the concept of "the unity of all"; and "Science—using the interconnectedness gateway—can play a crucial role in inspiring mankind to harness and release immense amounts of productive energy and build a better world for everyone."

Bedrij likens the "vast organizational linkages in this multidimensional structure" (our universe and its laws) to an endless series of Chinese boxes, one inside another. In the second half of his paper, Bedrij uses the equations of orthodox physics to demonstrate this concept. He has created four tables of figures and several individual figures that show the interconnectedness of the laws of physics.

First off, Bedrij assumes that the basic building blocks, or physical quantities, of nature have a fixed relationship to each other. It follows that, "as the basic building blocks organize to form different parts, the physical quantities change. Just as bricks join to form walls, and walls give birth to a house; so, the fundamental building block of space produces time, time makes matter, matter gives energy, energy builds

gravity, and so forth. A parallel situation exists in the formation of atoms. As the number of protons, neutrons, and electrons changes, so does the form of each element.'' The relationships between the elements are shown in the periodic table of the elements. Bedrij demonstrates the relationships between physical quantities in a table of physical quantities (Table I in Part II of the paper).

The relationships between physical quantities are not ordinarily observable. We live in time, space, and gravity, but our life also encompasses energy, matter, motion, and more. Whether we realize it or not, according to Bedrij, we all live in the same common system: ''Beneath the level of ordinary subjective perspective, the entire web of life is all a part of a single organism.'' The problem of perspective is one that physicists have long grappled with.

According to Einstein, as velocity changes, time and mass change as well. Observers in different frames of reference may obtain different numerical values for measured physical quantities. Still, the fundamental relationships between physical quantities, the laws of physics, are the same for all observers. Put another way, the laws of physics (and their fundamental quantities) are invariant.

Sign of the Times. Crucial to Bedrij's argument is the equal sign, the one common element in all physical equations. The equal sign signifies sameness and equality on both sides of an equation (such as $2 \times 3 = 6$). To Bedrij, the equal sign also shows unity among physical quantities and a ''transformation relationship between interrelated frames of reference''—a transformation interface between related physical values. In other words, ''the equal sign couples quantities together.''

Bedrij writes that the equal sign ''serves as a doorway through which the interaction and transformation of physical quantities, from one frame of reference (system of measurement or physical value) to another, can be represented. That is, it is possible to transform the measurements of one physical quantity into another using any permissible operation.'' This notion of transformation through the equal sign is paramount.

''To put it simply,'' Bedrij writes, ''the equal sign allows one, with clarity and economy of thought, to go from one system of measurement (frame of reference) to another. By performing the transformations between the quantities we thus can demonstrate that physical quantities are interconnected.''

Bedrij goes on to show that energy (W) is connected with electrical flux (q) and electrical potential (V) according to the equation: $W = qV$. ''We also know that electrical flux (q), electrical force (F), and electrical field intensity (E) are united according to the following equation: $q = F/E$. Therefore, through substitution of electrical flux in both equations ($F/E = W/V$), we can connect electrical force and electrical field intensity with energy and electrical potential ($W = VF/E$).''

Bedrij postulates that ''all laws of physics appear to have a number of other attributes'' in common in addition to invariance. Four of these common attributes are omnipresence, inseparableness, instantaneousness, and indivisibleness. As Einstein said, the laws of physics seem to be present in all places at the same time, or omnipresent. In addition, the laws exhibit ''instantaneousness''; there is no time delay between the transformation, operation, and measurement of the laws of physics at different locations. By ''inseparableness'' Bedrij means, ''The essence of the laws of physics and our existence seem to be inseparable.'' The final concept of ''indivisibleness'' is apparent in the table of physical quantities—''individual laws of physics are not made up of parts which can have independent existence.'' The laws are connected and form ''one indivisible unity.''

The Beginning Place. Continuing along these lines of thought, Bedrij defines what he calls ''that-which-is.'' By progressively classifying a ''particular universal behavior'' according to the characteristics that it shares ''with increasingly more laws of physics,'' we eventually arrive at the ''highest fundamental principle—the unchanging 'starting point' at which each law of physics begins.'' This invariable, inseparable, omnipresent, instantaneous, and indivisible ''first principle'' is called by Bedrij ''that-which-is.''

To illustrate ''that-which-is,'' Bedrij uses a monetary example. When five pennies equal one nickel and five nickels equal one quarter, the ''common link'' is money. ''Similarly, because both $W = qV$ and $V = ES$ . . . the fundamental principle that is being expressed in this statement is that-which-is.'' It follows that the ''building blocks'' of that-which-is are the physical quantities (W, q, V) and the ''relationships'' between the physical quantities are the statements of laws of physics ($W = qV$, $V = ES$).

Assuming that physical laws are the same ''in all reference frames and for all observers,'' that the physical quantities are invariable, interrelated, and unequal, and that most laws of physics define a given quantity by a relationship of two other quantities, then there should be a ''global quantity relationship.'' Bedrij writes, ''With the periodic table of the elements man has achieved a proton, neutron, and electron relationship between the atoms. With a table of physical quantities, we can achieve a global relationship among the physical quantities.''

This is where Bedrij must supply the ''proof of the pudding,'' as they say in physics circles. To do so, he provides four tables of figures that have been tested and verified. The first table includes the sequence and transformations of quantities by physical value from the smallest to the largest, starting with volume and ending with the Poynting vector. The second table shows the sequence and transformations of numbers by numerical value from the smallest to the largest. The third table includes the sequence of physical constants by value from the smallest to the largest. And the fourth table defines the quantities.

''Without the relationships of Table I, it would be difficult to demonstrate the grand relationship among the physical quantities (Table IV),'' Bedrij posits. This grand relationship is determined in two ways. Numerical values have to be found that satisfy all laws of physics at the same time (Table I). And a ''fundamental quantum-of-value (denomination)'' must be established for each quantity. To create Table I, Bedrij used a trial and error method, wherein the equations were programmed into a computer.

Looking for Links. Then, substituting numbers into quantities, he tried to find what ''number combination links all the equations. Having done this, we noticed that because all the relationships of Table I are united, by changing just one number in an equation, all numbers in other equations would change.''

Bedrij found that because of the ''multitudinous linkages among all laws of physics,'' modifying any quantity affects both that quantity and the ''totality.'' Using personal computers like the Apple II and IBM PC, Bedrij has performed hundreds of exercises to validate this.

The grand conclusion Bedrij reached is that ''each law of physics expresses a quantity relationship; and, because all of the laws are invariable and interrelated, each therefore is an expression of one grand relationship among the physical laws.''

The ''coin of lowest value (the smallest quantum of measure)'' is volume. Following volume are action (angular momentum), Planck constant, mass, area, capacitance, and so on. Using the ''universal constant parameters as a measuring frame of reference,'' Bedrij then performed the following conversions:

217,788 volume units =	1 action unit
68.52 action units =	1 Planck constant unit
1,374.78 Planck constant units =	1 mass unit

Bedrij is quick to point out that these conversion numbers apply only to the constants he provides in the third table because each amount of a physical quantity depends on the frame of reference. Moreover, ''because of the invariable relationship between the laws of physics, once conversion numbers that connect the physical quantities are known (Table III), only one point of reference is needed to generate new calculations for another table.'' The acid test for Bedrij's unification scheme involves taking all the equations in the table of physical quantities and the numbers in Table III and cross-multiplying them.

The implications of this ''dry'' unification are quite astounding, according to Bedrij. ''At the heart of it all—we are truly fused into a single body underlying the physical reality. Mankind is one! The world is our lifeblood and all its citizens are our immediate family.''

Notes from the Underuniverse. One fellow theorist who is on basically the same track as Bedrij is London University's David Bohm. ''His theory is more global,'' says Bedrij, but the two are very close together in their final assumptions. Bohm claims that physicists have relied too long on ordinary space and time as the fundamental categories of objective reality. In his book *Wholeness and the Implicate Order*, Bohm maintains that there is a deeper level of objective reality that he calls ''the implicate order.''

Bohm's controversial proposals posit that the everyday world of trees, human beings, and superclusters belongs to the ''explicate'' order; that is, trees, humans, and galaxies are manifest in ordinary time and

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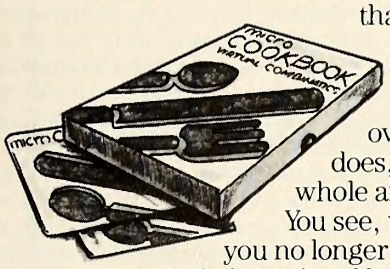

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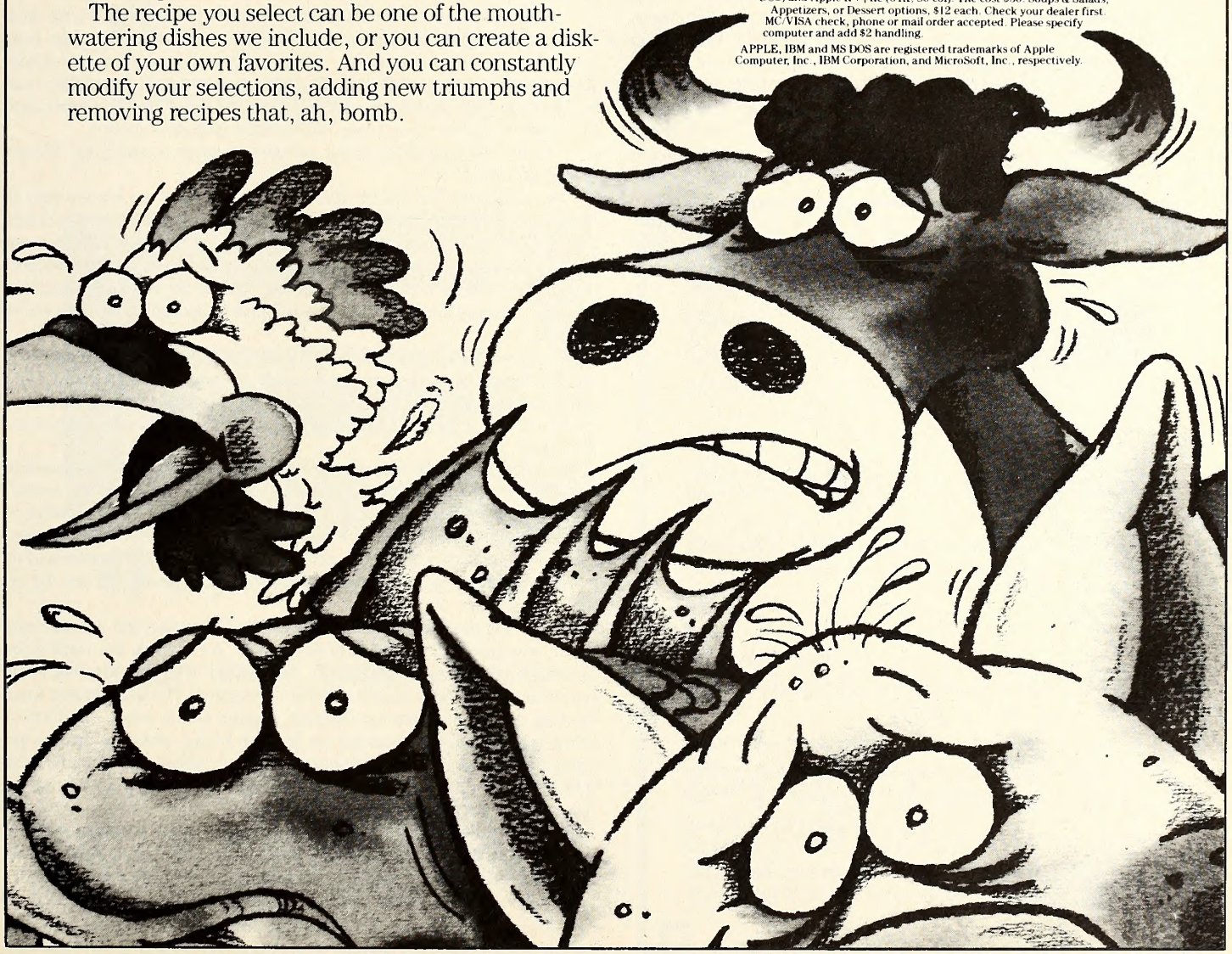

space. Within the implicate order everything is connected to everything else, and everything is interconnected in such a way that careful study of any individual element could theoretically reveal detailed information about every other element in the universe.

Metaphorically, Bohm's explicate order universe resembles a dictionary—wherein every word's definition also contains definitions of every other word in the dictionary—and a hologram. The latter comparison offers a way to approach both Bohm's and Bedrij's ideas.

Scientists make a hologram by bouncing a laser beam off the light waves reflected by an object bathed in the light of a second laser and then recording on film the interference patterns resulting from this luminous collision. The exact pattern of lightness and darkness at every spot on the film is completely determined by the overall configuration of the interference pattern. Thus, every point in the hologram contains information about the light values at every other point.

To the naked eye, the photographic record of the information contained in a hologram is a disappointing blur. But if one shines a laser beam through the film, a lifelike, three-dimensional image of the original scene appears above the film plane. When a hologram is cut up into tiny chunks, one can still reconstruct the entire three-dimensional scene by shining a laser beam through any one of these chunks. The image, though, will be much blurrier than if the hologram were intact.

Bohm's theory, with the help of the hologram analogy, strives to illuminate such well-known but heretofore unexplained holistic phenomena as the EPR effect. First noted by Einstein and his collaborators at the time, Boris Podolsky and Nathan Rose, the EPR effect is a strange phenomenon wherein two particles that were once joined together display instantaneous knowledge about their former mates even when separated by time and space. Traditional quantum mechanics, as founded by Niels Bohr and interpreted by the Copenhagen school of thinking, denies the possibility of ever being able to understand the causes of an individual subatomic particle's motions. Specifically, Werner Heisenberg proved that it's impossible to measure precisely both the position and velocity of a particle at the same moment. Furthermore, on the surface, the EPR phenomenon seems to violate relativity's ban on faster-than-light physical influences. But under the surface, according to Bohm, the particles aren't really separated.

The equations describing Bohm's subquantum interactions state that in most cases there is no way to determine adequately the behavior of any collection of subatomic particles without also taking into account their multitudinous linkages with the more than 10^{89} other particles in the rest of the universe. "Everything interpenetrates everything" in Bohm's superholographic cosmos. He has essentially provided the model for the universe that Bedrij describes with mathematical equations.

Bohm is best known for writing a classic quantum mechanics textbook and for deriving the hidden-variable theory, as well as for his work in plasma physics. Most of his colleagues, including the mainstream Copenhagen school of quantum mechanics, are intrigued by but not convinced about the truth of Bohm's assertions. Bohm himself admits there is still much more work to be done. Likewise, Bedrij—with his "faint glimpse"—is convinced that "new vistas of great opportunity are opening before us," but ultimately we must "let the future bring more truth."

Accelerated Consciousness. If Jonas Salk's notion of metabiological evolution (the idea that ideas are to the evolution of consciousness what genes are to the evolution of biological organisms) is on the mark, then Bohm's and Bedrij's theories may signal the beginning of an accelerated phase in man's overall development. According to Salk, who developed the first polio vaccine in 1954, ideas determine the nature, characteristics, and behavior of a metabiological cell (individual) or of the metabiological organism (society).

Bedrij sees whole new technologies emerging from his "Grand Unification of Physics"—technologies, like nuclear fusion, that can be put to good and evil uses. How these technologies are developed and what shape they take are Bedrij's main concerns now. Bedrij wants to achieve a global LSI (large scale integration), but with people instead of computer chips.

"Specifically, as Einstein and others declared to be true: We are each 'a part of the whole,' " Bedrij writes. "This single organism, like your own body, has countless 'parts,' which—depending on your own space-time scenario—appear different. Since our perception is incomplete, and we can't see the comprehensive space-time linkages, we don't appreciate the positive aspects of our deep connections with each other.

"A very exciting phase in our human adventure is emerging. We are all a part of it."

The optimism that Bedrij feels for the future of the human race is founded on his knowledge of scientific truths. On the surface, it seems like we've replaced Milton's omnipresent God with the omnipresent laws of physics. But ultimately, the nature of the truth is not as important as what we do with it. The challenge facing us is to keep searching for the "ultimate force in the cosmos" and to recognize it when we've found it.

In the words of C.P. Snow: "There are going to be challenges to our intelligence and to our moral nature as long as man remains man. After all, a challenge is not, as the word is coming to be used, an excuse for slinking off and doing nothing. A challenge is something to be picked up."

Challengers of the Unknown. At the age of sixteen, Albert Einstein renounced his German nationality and became a citizen of the world. This bold act, from one who has been called the most unsentimental of men, was more attributable to Einstein's negative feelings about his German homeland than a desire to call all men his brothers. Einstein said he "belonged to the world." And indeed, the entire planet has felt the effects of his work.

There are those of us who value our individuality and separateness more than any material form of happiness. We cherish the right to be miserable, content, or continually unsatisfied. The thought that some politicians wield the power to end it all is irksome. The thought that some shifting continental plate or bulging magma could wreck our lives is downright outrageous. And yet we keep on living, knowing that we are doing the best we can as individuals to keep our world from sinking back into primeval darkness. In a world where the notion of sin is rapidly fading, fatalism is perhaps the greatest crime.

Science and the indomitable spirit of man are the strongest bastions keeping back the hungry wolves of racial failure. We must stand behind our scientists and great thinkers. The more truth we discover, the more good we'll eventually uncover, though we remain forever unsatisfied. ■

A copy of Bedrij's "The Grand Unification of Physics" can be obtained by writing the Einstein Research Institute, at 347 West Forty-Eighth Street, New York, NY 10036.

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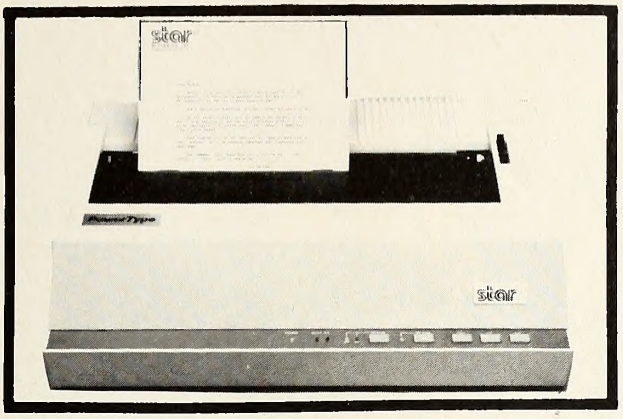

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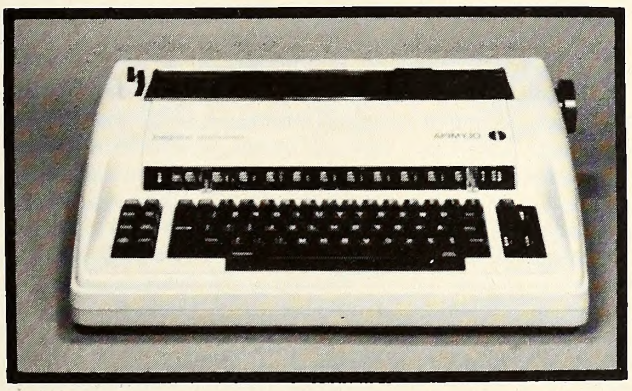

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The Schoolhouse Apple

by Jock Root

Don't Miss the Bus

By Guest Author Ross Lauck

Most of us have heard something about networking—the idea of tying several computers together into one system—but we haven't heard very much. Hints and rumors, mostly, with no details. For example, networking is supposed to save lots of money, but nobody can explain how. There's lots of curiosity around, but very little hard data.

Well, we have some for you here. This month's column is by Ross Lauck, a teacher who has actually set up a network system and worked with it—specifically, the brand new Apple SchoolBus system. Lauck is fully qualified as an observer. A high school biology teacher for fifteen years, he recently became coordinator of computer services for the Joplin, Missouri, public school system, and he also happens to be president of the Joplin Apple User Group. For your information, here is an account of one teacher's experience with networking.

The idea of connecting several microcomputers in a common "net" has long appealed to educators. Many see it as a way to make more efficient use of their school's micros. With this arrangement, one instructor can monitor, direct, and interact with some twenty students, all involved in different activities at separate stations. This appeals to many administrators who must evaluate the use of computers in their schools.

Is this scenario what your school needs? Does it fit in with your plan for the computers in your school? Will it really save you money? Does a networked computer lab really improve efficiency?

Answering those questions can be a frustrating task. Information is difficult to gather, primarily because few schools have had much experience using networks. One of the reasons for that lack of experience has been the difficulty of networking Apples, although Apples are the "micro of choice" in the majority of school systems. Based on a comprehensive survey of public schools in the United States, Quality Education Data, a Denver-based information company, recently reported that over 55 percent had chosen Apples for their educational computing needs. Certainly, then, any networking system hopeful of finding acceptance in America's public schools should support Apples, and support them well. Apple recently announced its plans to make networking for schools a practical alternative to a traditional standalone computer lab. Those plans center on Apple's newest educational product, the Apple SchoolBus Network.

Busing and Integration. The SchoolBus lets you connect one instructor station with one to four disk drives, one to thirty student stations, and a printer attached to one of the student stations. In addition, with an optional larger power supply you can attach four more drives to the instructor station. A printer may also be attached to the instructor's unit.

There are several restrictions imposed by the SchoolBus system. For example, the system can't have more than one hundred meters (about three hundred thirty feet) of SchoolBus cable in the network, or more than eight disk drives at the instructor station. You can't use any eighty-column text cards, any card that causes interrupts (such as a clock card), any device whose input to the student stations would be interfered with by the SchoolBus Operating System (such as the Graphics Tablet), or an Apple that doesn't have Autostart ROM.

The SchoolBus comes in two kits. The Starter Kit allows you to set up a network composed of an instructor station and two student stations. An Add-On Kit is then needed for each additional student station you wish to add to the net.

Installing the system is merely a matter of plugging the SchoolBus controller cards into each unit in the net and then connecting the units in daisy-chain fashion with the supplied cables. This should be easy for anyone experienced at installing Apple peripheral cards. For those who've never touched the inside of an Apple, there's a thorough installation manual.

Not Springsteen. The heart of the SchoolBus, beyond the hardware necessary to connect the networked units, is the SchoolBus Operating System, called BOS (those folks at Apple marketing sure are clever!). BOS is supplied by Apple on disk with the Starter Kit. To use the SchoolBus system, you must first create or modify a special file, called a Class Control File (CCF), contained on the BOS disk. The CCF allows you to specify who may use the system, what their special passwords will be, the type and amount of disk access each student may enjoy, and what special program BOS will automatically run when students first sign on at their stations. This special startup program gives the SchoolBus tremendous flexibility. The program may take many forms—a simple welcome message, the assignment for the day, or the final exam.

Once the CCF file is prepared, you activate BOS by starting the system with the SchoolBus Master Disk. A student gains access by turning on the Apple at his or her station (or if the Apple is already on, by issuing a PR#n command, where n is the slot number of the SchoolBus controller card for that station) and typing a password. In order to protect the integrity of student passwords, provisions have been made to prevent the password from being shown on the screen as it is being typed by the student. Of course, student passwords may be changed by the teacher at any time.

Once a password is accepted, BOS is loaded into the student station and the startup program, previously specified by the teacher, runs at the student station. At the program's completion, the student can run Basic, try out programs the teacher makes available, or work on his or her personal files stored on the disks at the instructor station. Students can use nearly all the DOS commands to create and modify files, all under the teacher's control. BOS handles access to the disk drives at the instructor station within the limits the teacher has imposed; access is generally on a first-come, first-served basis.

Power to the Teacher. While all this is going on, the powerful SchoolBus Operating System gives you almost total control over the network. You can easily disconnect the link between your station and the student stations, use the equipment at the instructor station independently, and then reconnect the link. One student station or all the student stations can be placed on hold to await further instructions, and you can transmit a program to any or all stations for immediate or later use.

You can also view the status of each student station at any time. The *stat* command shows a student's password, his or her permitted disk access, the program being run, and the last command the student typed in. Any student can request your help by using the *help* command, and messages can be exchanged between the instructor station and any student station. Using the *look* command, you can see a "snapshot" of the current screen at any student station.

Bus BOS. Apple provides plasticized BOS command summary cards for the instructor station and for each student station. There are forty-eight BOS commands; twenty of them are unique to BOS, and the other twenty-eight are the same as regular DOS commands. The commands are grouped according to the station(s) that can use them:

1. *Instructor commands* are those that can be used only at the instructor station. An example, for obvious reasons, is the DOS *init* command. Most of the commands unique to BOS are for the instructor's use only.
2. *Common commands* can be used at the instructor station and at student stations. They are all DOS commands, some of which have been modified slightly for use under BOS.

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3. *Student commands* are those that have no practical use at the instructor station while BOS is in effect. They are therefore restricted to student station use.

Essentially, BOS uses the same file types as DOS—Applesoft Basic, Integer Basic, binary, and text files. For the purposes of providing security, BOS further classifies files according to who can use them. Three classifications of SchoolBus files are provided: instructor private files, student private files, and common files.

Instructor private files are locked system files that were either provided on the SchoolBus Master Disk or created at the instructor station. They can be accessed only at the instructor station.

Student private files are those saved from a student station. Each of these file names includes the password of the student who created it. Only that student and the instructor can have access to it (unless or until the instructor changes the status of the file).

Common files are those files saved at the instructor station but not locked (to differentiate them from the instructor's private files). An example of a common file would be one created at a student station that later had its password removed at the instructor station. Common files can be accessed from any active student station.

Almost as an aside, the SchoolBus Instructor's Manual mentions that provisions have been made for the instructor to specify volume numbers when saving or retrieving files. According to the manual, the volume option has been provided in case one has a "multivolume disk." In any event, being able to specify volume numbers makes it easy to convert the SchoolBus Operating System to ProDOS, which opens up the Apple II family of computers to the use of the ProFile hard disk.

This may be an important point for those who are considering installing a network. One of the problems with using a network based on floppy disk storage is that delays can occur when a multitude of users are attempting to use the drives for storage and retrieval. Students may experience considerable delay while attempting to store or retrieve programs, especially if the application programs they're using require a lot of disk access. Remember, SchoolBus handles student station disk access requests in the order they come in; all stations attempting to access a disk are put on hold until their turn comes. By using ProDOS and the faster speed of a hard disk, the problems of disk access delay should be significantly reduced.

The Big Picture. Let's look at the relative pros and cons of networking in general. Is it for you? To a large extent, the answer to that question depends on your needs and the goals for your computer lab (there never seems to be an easy answer). There are several things to consider, beginning with the question of mobility. How important is it to be able to move the computer systems around? Do you use them in the same room every day, all day? A networked system, whether SchoolBus or some other, severely limits the locations in which computers can be used. If the language arts department needs them for its two-week unit on word processing (the one you've been trying to talk the language arts staff into for so many years), there'll be some definite problems if the computers are wired into a network. Not insurmountable problems, mind you, but problems that may put a crimp in your teaching style. Of course, arrangements can be made to bring the students to the computers rather than taking the computers to the students (as has usually been done in the past). Whatever solution you decide is best, mobility is definitely something to consider.

Networked systems return a great deal of control to the teacher in charge of a computer lab. If you are at all unsure of how to maintain a firm grip on your computer classes, you may find that networking is a way to boost your confidence. Anyone who has ever visited a high school computer lab can tell you how difficult it is for one teacher to keep track of twenty or more students using standalone micros. It's not uncommon for students to seize the opportunity afforded by the teacher's diverted attention to boot up their favorite alien attack games and proceed to defend the universe. That type of use of the school's micros is probably not a part of your plans and can be especially disturbing when it occurs at precisely the moment the superintendent decides to show off your computer lab to visiting dignitaries!

With a networked system, you control student access to computers, data files, and software in general. The teacher in a networked computer lab is much more firmly in control than is his or her counterpart in a lab of standalone computers. While this kind of control over software and its use may be useful, it may or may not be the way we want to teach our children about computers. Is it what they will find in the real world? In the end, the decision to exercise this control must depend on your plan, your goals for computer education.

No discussion about networking in schools would be complete without considering the problem of copy-protected software. Protected software cannot be used on a networked computer system—not yet at least. There are several possible solutions to this problem, but the jury is still out. We'll just have to wait and see what the software publishers and Apple-inspired secondary industry come up with. For now, if your computer education program depends on students being able to run protected software (your favorite word processor or electronic spreadsheet, for example), think carefully before installing a networked computer lab.

In summary, the Apple SchoolBus Network appears to be very good, even excellent; it's very likely the best such system available for schools. However, networking may not be the answer to your computer education needs. It is hoped that the issues raised in this article will help you make that determination. If you decide that a networked computer lab is what your school needs, the SchoolBus is certainly worthy of your consideration. ■

The Voice of THE TURTLE

A Schoolhouse Apple Tutorial

LOGO

DONNA BEARDEN

Recursion

One of the advantages of Logo, according to the Logo gods, is recursion. You know recursion—it's the ability of a procedure to call itself. Simple, right? It can be, but it can also be extremely complex. Let's just

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start with simple and see how far we get. . . .

A very simple example of recursion is a procedure that spins a geometric shape—perhaps a square or a triangle—into a blossom.

```
TO BLOSSOM
REPEAT 4 [FD 40 RT 90]
RT 25
BLOSSOM
END
```

The turtle draws a square, turns right twenty-five degrees and starts over. He'll continue until you stop him with control-G. There are several ways we can add a STOP within the procedure. For example, we might have the turtle check its heading and stop when it returns to its original position. Or we might set up a counter and have the turtle repeat the procedure a certain number of times.

```
TO BLOSSOM :TIMES
IF :TIMES = 0 [STOP]
REPEAT 4 [FD 40 RT 90]
RT 25
BLOSSOM :TIMES - 1
END
```

Suppose we want to completely fill in a square with color. We can use recursion to help us do that. Define a procedure to have the turtle draw successively smaller squares:

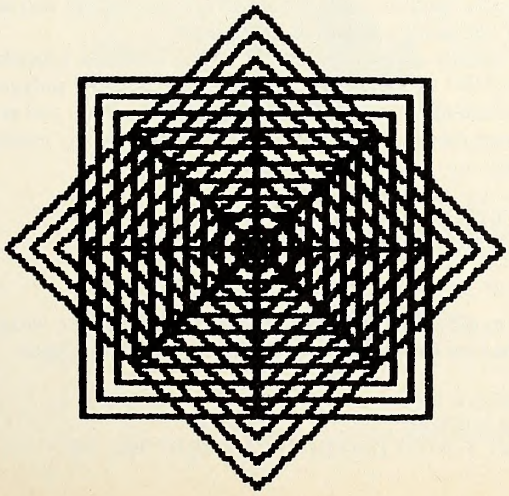
```
TO FILL.SQUARE :X
IF :X = 0 [STOP]
REPEAT 4 [FD :X RT 90]
FILL.SQUARE :X - 1
END
```

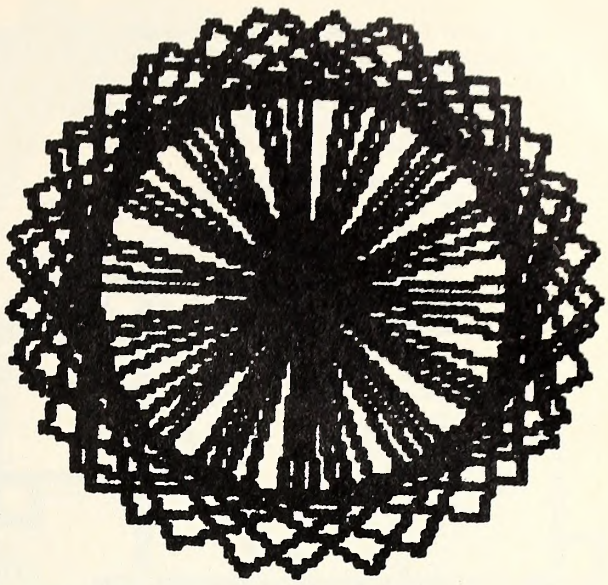
Instead of subtracting 1 in the recursive line, we could subtract 3. Then we could combine BLOSSOM and FILL.SQUARE to design a hybrid. Let's also add a variable for the angle. Then we can experiment with various angles at the same time.

```
TO BLOSSOM2 :X :A :TIMES
IF :TIMES = 0 [STOP]
FILL.SQUARE :X
RT :A
BLOSSOM 2 :X :A :TIMES - 1
END

TO FILL.SQUARE :X
IF :X < 1 [STOP]
REPEAT 4 [FD :X RT 90]
FILL.SQUARE :X - 3
END
```

This is BLOSSOM2 50 45 8. Do you see that if you want to make one full rotation, the product of the last two numbers in the command has to equal 360? (In this case, 45 × 8 = 360.)

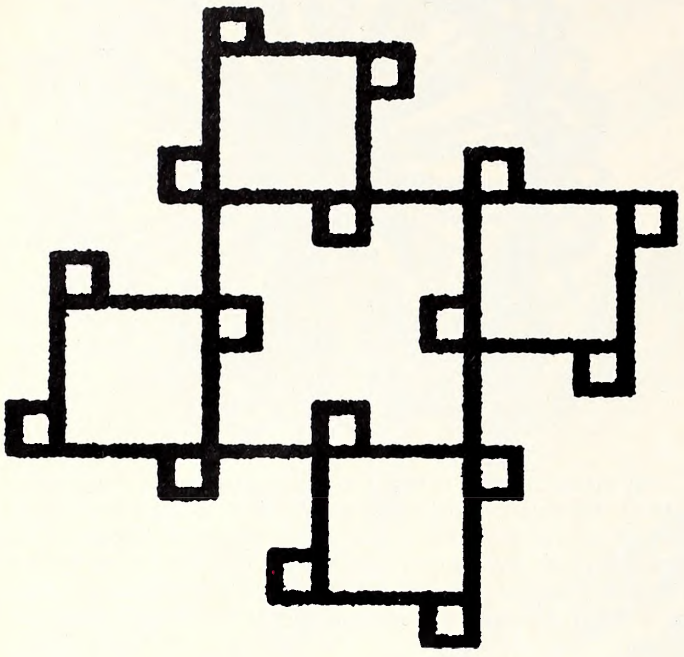




The examples we've looked at so far are examples of "tail-end" recursion. The recursive call comes at the end of the procedure. If this is the only way you've worked with recursion, you may get the idea that recursion is simply looping or repeating; that's not quite correct. Let's use a procedure similar to the FILL.SQUARE procedure, but let's embed the recursive call within the repeat command. What do you suppose will happen?

```
TO DESIGN :X
IF :X < 5 [STOP]
REPEAT 4 [FD :X DESIGN :X - 15 RT 90]
END
```

It looks like we'll be creating a series of squares, each being fifteen turtle steps smaller than the previous one. Let's try DESIGN 36.

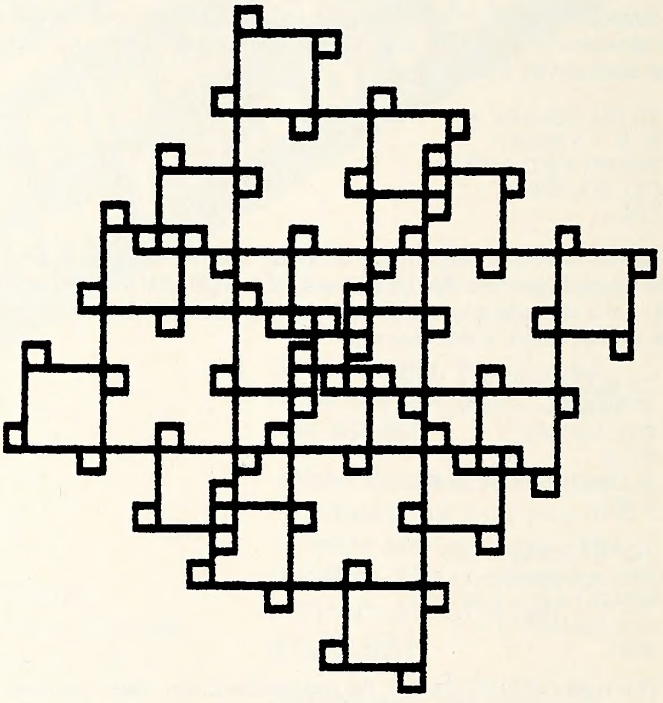


Wow! Is that what you expected? It drew successively smaller squares, all right, but how and why did the pattern occur?

When we gave the command DESIGN 36, the computer first checked to see if :X (36) was smaller than 5. It wasn't, so the procedure could proceed to the next command, which was REPEAT 4 [FD :X DESIGN :X − 15 RT 90]. The turtle goes forward 36. Now comes the recursion. DESIGN :X − 15 calls the DESIGN procedure but changes the value of :X to 21. The computer checks to see if :X < 5. It's not. The turtle now goes forward 21 and again comes to the recursive call. The value of :X becomes 21 − 15, or 6. Since 6 is not smaller than 5, the turtle goes forward 6. The recursive call this time causes the value of :X to become less than 5, so the procedure stops and control is passed back to the calling procedure (6). The turtle can now complete the small square.

When the procedure to draw the small square is completed, control is passed back to the procedure that called it. The calling procedure was REPEAT 4 [FD :X (21) DESIGN :X − 15 RT 90]. The turtle has already carried out one of the REPEATs, so it has three more to go. But each time it goes forward 21, it must pass control on to DESIGN :X − 15 and draw a small square, 6 turtle steps to a side. The result is a 21-step square with small squares at each corner. When that's done, control can be passed back to the original calling procedure. All of that equals one repeat of the four repeats in the original calling procedure. So take it from the top three mores times. . . .

If you think that's fun, try DESIGN 51.



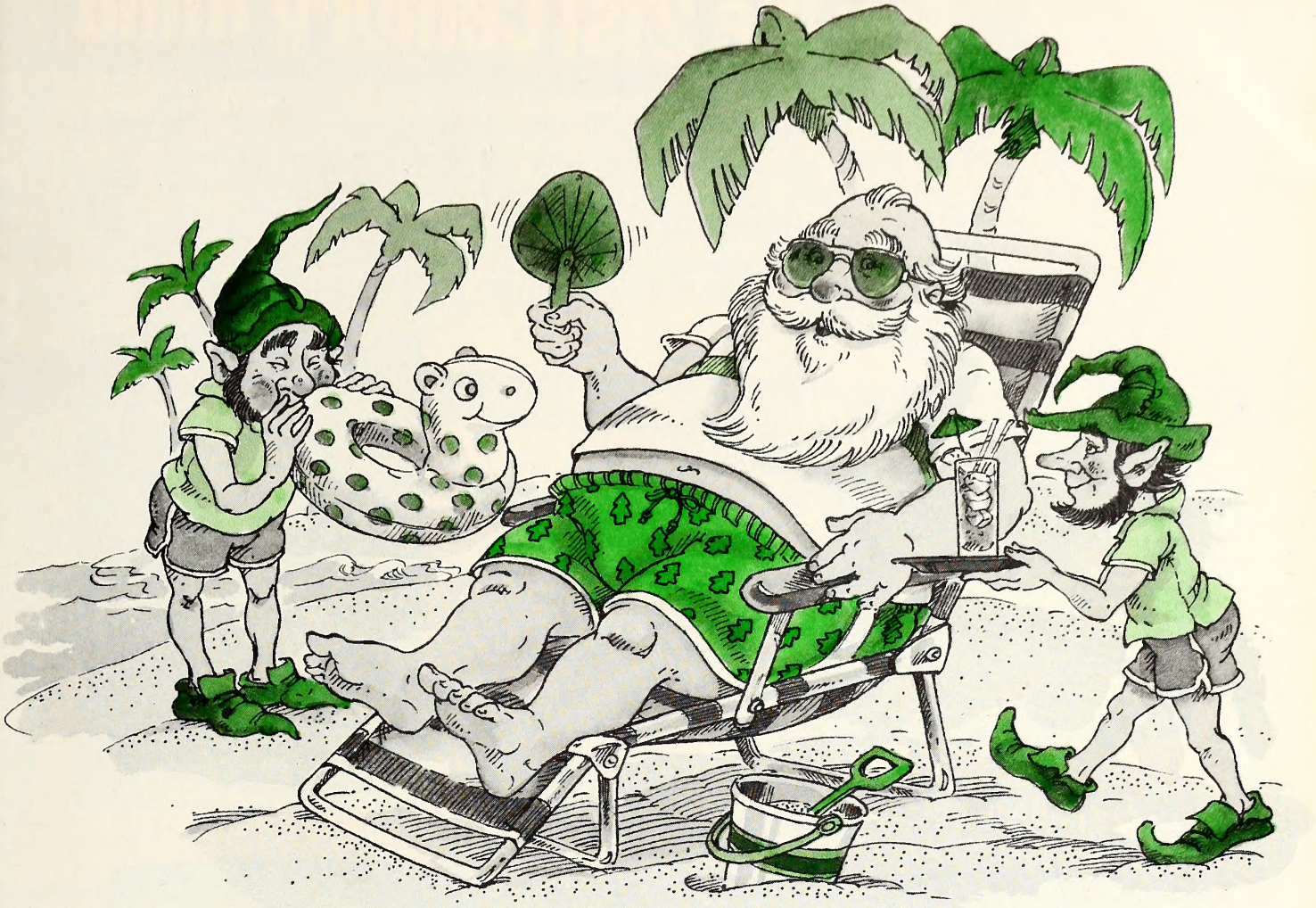
Do not get discouraged if you don't understand it. You can still play with the DESIGN procedure, make slight modifications in it, and design some fantastic patterns. And the more you experiment and see patterns emerging, the more it begins to make sense.

Let's make a major modification in the DESIGN procedure, which will then allow us to explore patterns made of other polygons. If you know the Rule of 360 or the Total Turtle Trip theorem, you are probably familiar with the procedure that enables you to draw any regular polygon of any size:

```
TO POLYGON :R :X
REPEAT :R [FD :X RT 360 / :R]
END
```

If we modify the DESIGN procedure to include the variable for the repeat, then we can make designs with any regular polygon:

```
TO DESIGN 1 :R :X
IF :X < 5 [STOP]
REPEAT :R [FD :X DESIGN1 :R :X − 15 RT 360 / :R]
END
```



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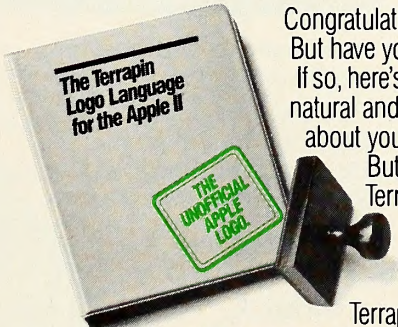

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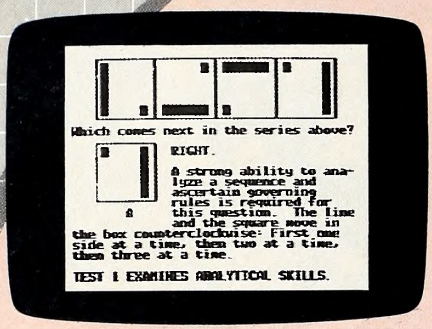

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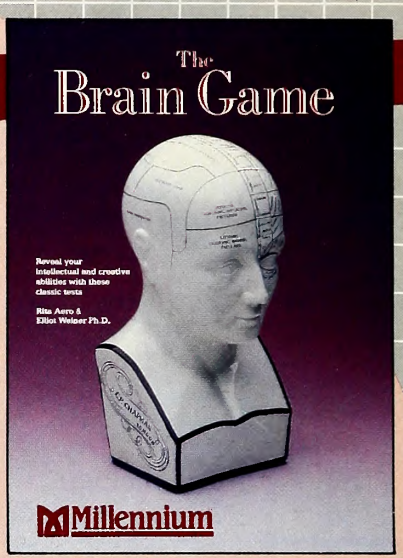

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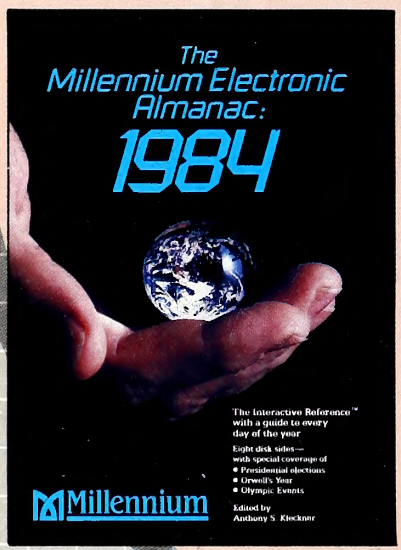

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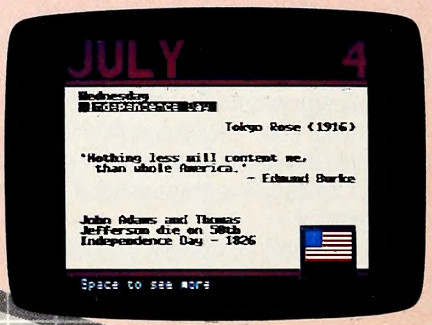

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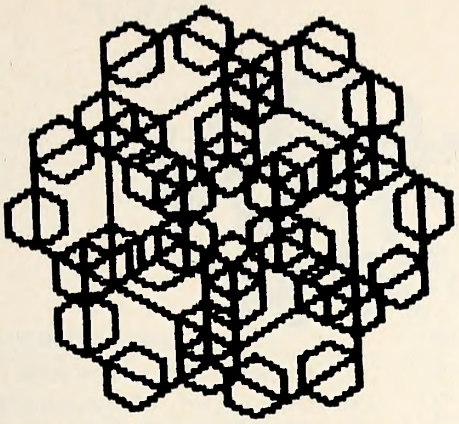
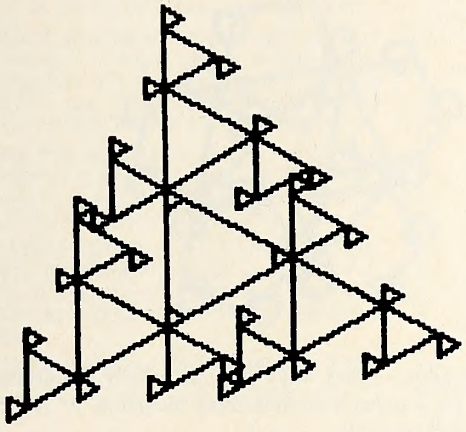
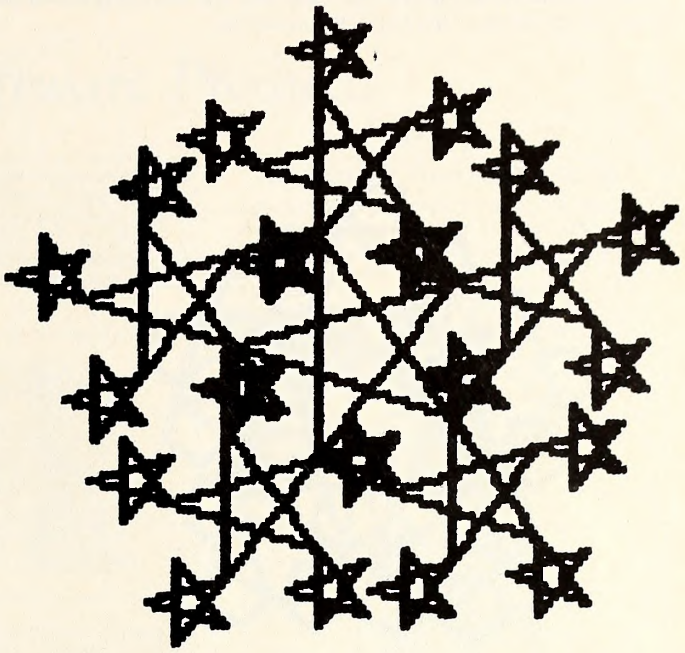




If we change the RT 360 / :R to RT 720 / :R, we could probably design some patterns with stars.

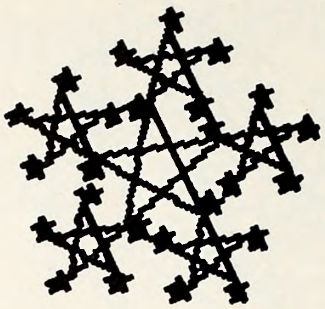
```
TO DESIGN2 :R :X
IF :X < 5 [STOP]
REPEAT :R [FD :X DESIGN2 :R :X - 15 RT 720 / :R]
END
```

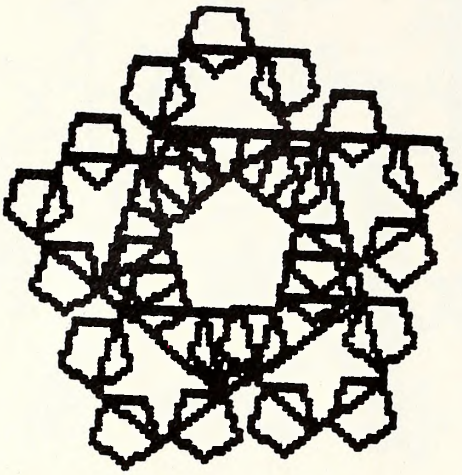


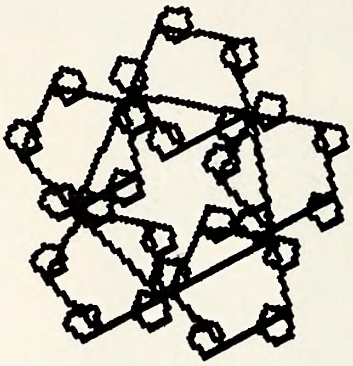
What would happen if, instead of subtracting 15, we divided by 2?

```
TO DESIGN3 :R :X
IF :X < 5 [STOP]
REPEAT :R [FD :X DESIGN3 :R :X / 2 RT 360 :R]
END
```

Compare the following designs made with the same inputs and the various modifications of the DESIGN procedure.







There are countless other ways you can modify the procedure and create designs. So whether you understand recursion, or you're recursing it, you can still enjoy it! ■

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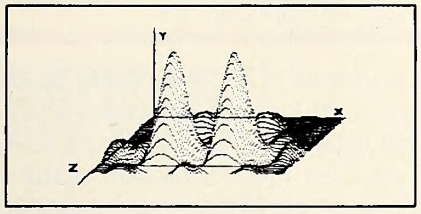

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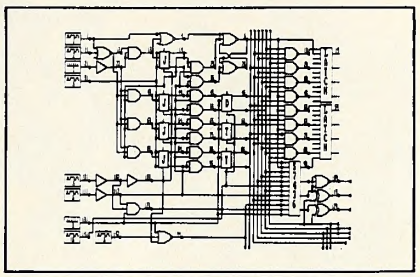

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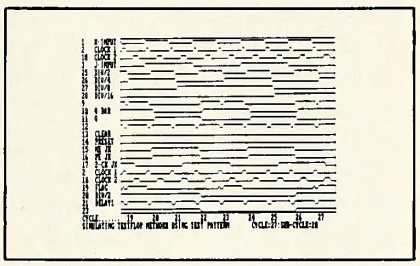

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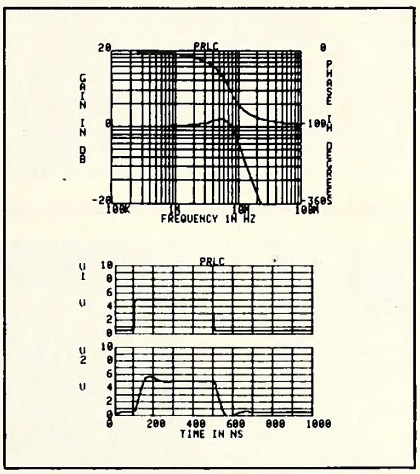

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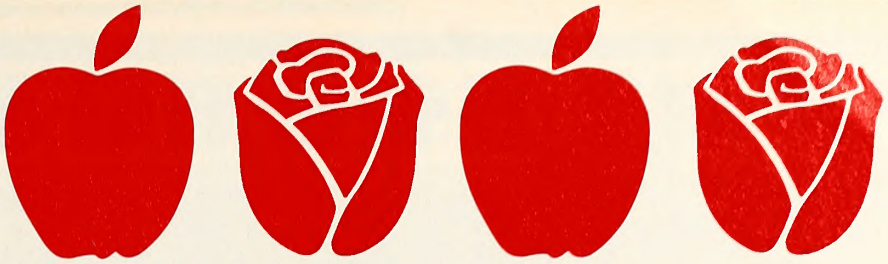

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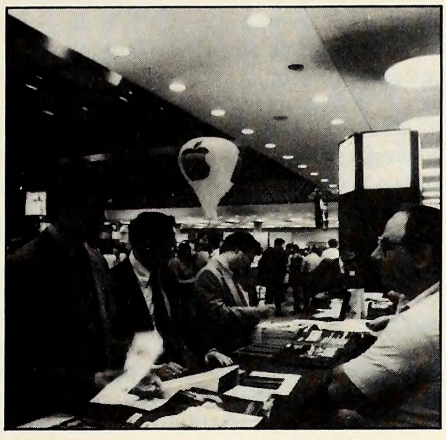

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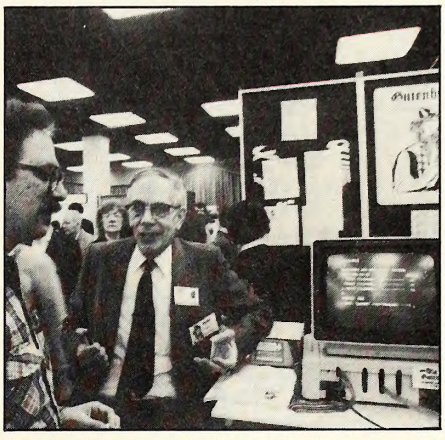

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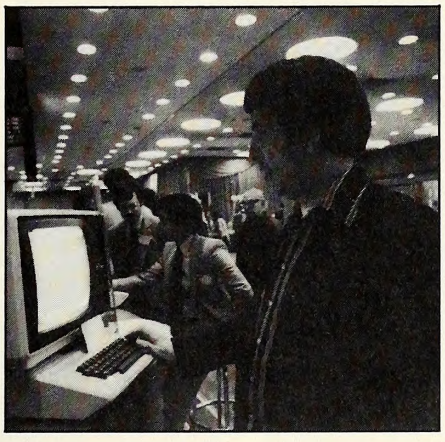

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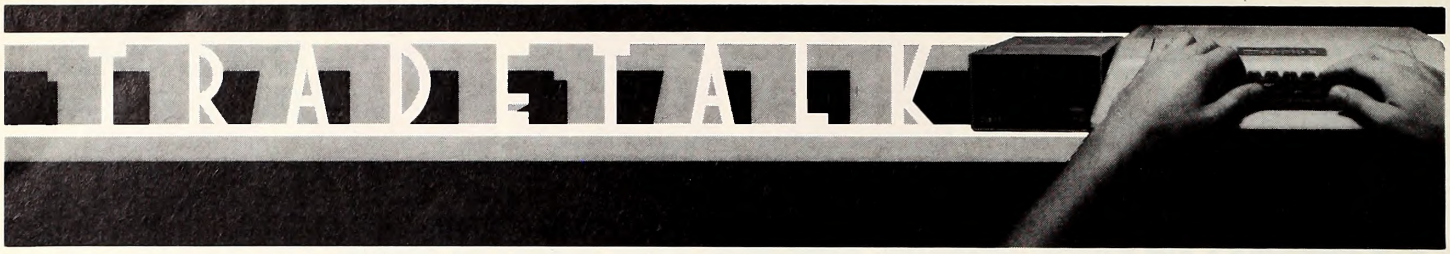


FRANKLIN ACED OUT, PAYS COPYRIGHT SETTLEMENT

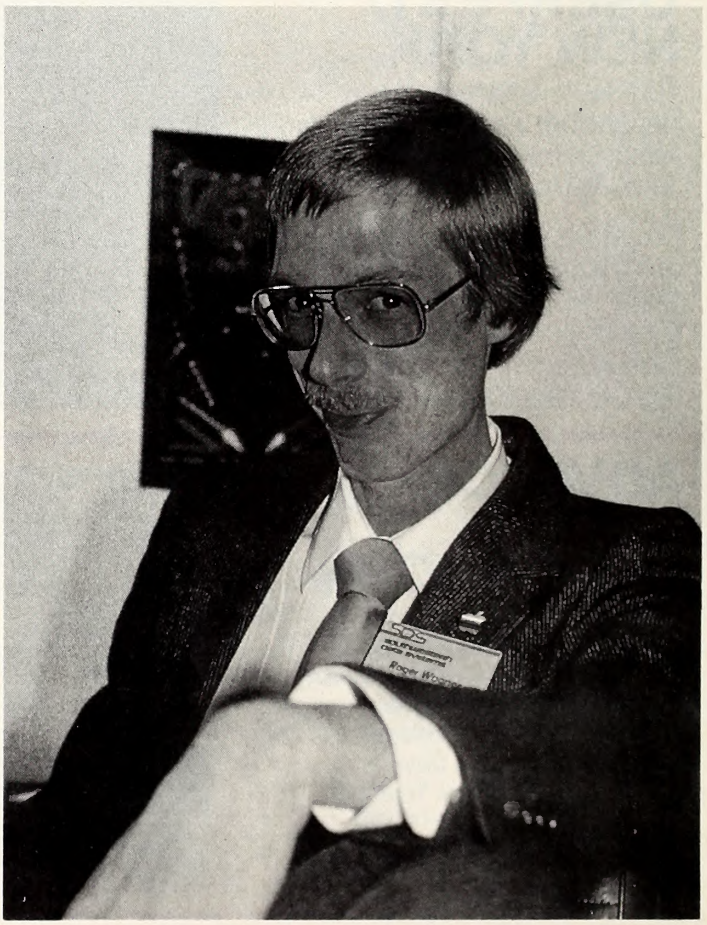
☐ **Apple Computer** (Cupertino, CA) has won a $2.5 million settlement in its precedent-setting copyright infringement suit against **Franklin Computer** (Cherry Hill, NJ). The settlement, which requires Franklin to stop manufacturing computers using Apple's operating system by April 1, also sets up an arbitration procedure to take care of any future disputes between the two companies, according to **Barbara Krause**, comanager of corporate communications at Apple. Krause declined further comment on the arbitration procedure. The suit began when Apple charged Franklin with copying fourteen of its operating systems and Franklin responded by challenging the validity of Apple's copyrights. After a Philadelphia District Court ruled in favor of Franklin, Judge Dorothy Sloviter of the Third U.S. District Court of Appeals overturned the ruling, stating that Apple's DOS could be copyrighted. The case was then scheduled to return to the lower court. "We're very glad that Franklin settled. If they went to the lower court it would take a long time and they could continue to create computers," Krause commented.

☐ **Orange Micro** (Anaheim, CA) marketer of the Grappler+ printer interface card, has terminated its long-standing contract with Grappler manufacturer **Street Electronics** (Carpinteria, CA). Orange Micro will now manufacture the Grappler+ themselves, Don Johnson, Orange Micro vice president has revealed. Under the terms of the terminated contract, Orange Micro acquired the copyright and trademark rights to the printer interface card while Street Electronics gained the manufacturing rights. Street Electronics will not concentrate on manufacturing the Echo II speech synthesizer and on developing as-yet-unnamed products, said **Milo Street**, president of Street Electronics and the designer of the Grappler+ and Echo II.

☐ **Adventure International** (Longwood, FL) and **Marvel Entertainment Group** (New York, NY) have signed a long-term licensing agreement that will allow Adventure International to create at least twelve graphic adventures featuring the Marvel comic book characters. Marvel will create a special series of comic books to accompany the series. "By tying the software together with the highly collectible comic super heroes, such as The Hulk, Spider-Man, and Captain America, a cult following is certain to develop," said **Scott Adams**, president of Adventure International.

☐ **Southwestern Data Systems** (Santee, CA) has changed its name to **Roger Wagner Publishing Incorporated**. "The company has been getting bigger and we felt it was time for a change. The new name will help people make the connection between me and my company," RWP president **Roger Wagner** said.

☐ Disk drive manufacturer **Rana Systems** (Chatsworth, CA) has announced the appointment of **Robert L. Bledsoe** as president. Prior to joining Rana, Bledsoe served as vice president of finance for Shugart Associates and as director of finance and strategic planning for Xerox Corporation. Rana has also opened ex-

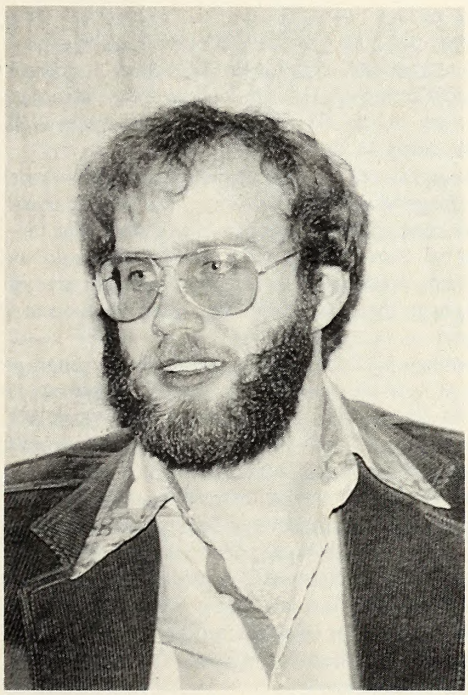


Scott Adams, president of Adventure International (left), Roger Wagner, president of Roger Wagner Publishing

panded production facilities. The new address is 21300 Superior Street, Chatsworth, CA 91311.

☐ **EduSoft** (Berkeley, CA) has announced its solution to the software-copying dilemma: a low-cost site license for educational software. The site license, which costs $35, will enable teachers to make copies of each licensed software package for every computer in the school or will let them load the licensed software onto a hard disk for the school's computer network. "As a former teacher, I understand the limitations of school budgets for software, and I'm well aware of the problems teachers face in trying to use a single program at several different computers. I think it's time the industry responded to this dilemma," EduSoft editor **Steven Rasmussen** said. EduSoft states that its site license is modeled directly on the policies proposed by Computer Using Educators and the International Council for Computers in Education.

☐ **Synergistic Software** (Renton, WA) has licensed the publishing rights to several of its programs as part of its transition from software publisher to software author house, according to Synergistic president **Bob Clardy**. **HT Enterprises** (Cerritos, CA) has acquired the publishing rights to *The Data Reporter*, and **Gessler Publishing** (New York, NY) has picked up *Higher Text*, *Higher Graphics*, and *The Game Animation Package*, Clardy said.



Synergistic Software's president Bob Clardy

☐ **Data Encore** (Sunnyvale, CA) has announced the appointment of **Jean Ludwick** as national sales manager. She will be responsible for all sales activities, including long-range sales and marketing planning for the software duplication company, a division of **Verbatim**. Before joining Data Encore, Ludwick served as regional sales manager for Zytron Corporation and as a field representative for Xerox Education Publications.

☐ Power surges are second only to theft among reasons for computer loss, according to a year-long study of insurance claims conducted by **Safeware** (Columbus, OH), a computer insurance firm. "Power surges accounted for a third of all claims paid by Safeware," said Safeware chairman **David Johnston**. In many cases, damage occurred even though computers were fitted with surge protectors, Johnston said. Thefts accounted for half of all Safeware insurance claims.

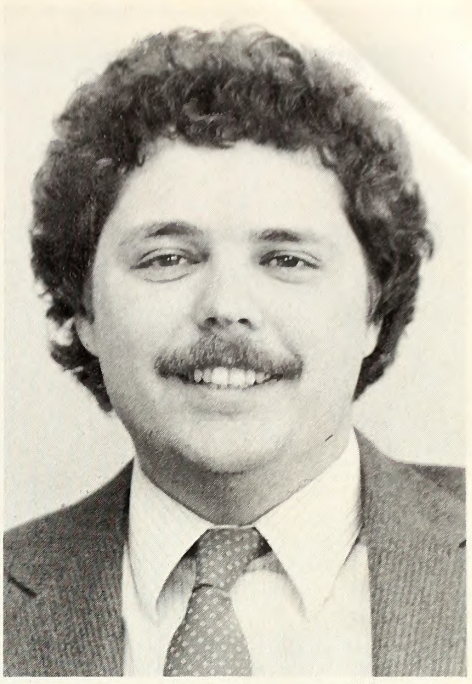
☐ **Glenn Ochsenreiter** has been named software buyer at **Waldenbooks** (Stamford, CT). In addition to his new post, Ochsenreiter will continue to serve as assistant manager of software marketing. "My primary responsibility is to implement a marketing plan enabling Waldenbooks to become a major software retailer," Ochsenreiter said.

☐ According to Dewar's Profile of Computer Professionals, a study based on interviews with more than three hundred industry employees, job satisfaction among those who work with computers is extremely high—over 90 percent are not considering leaving the field, and 80 percent would not even change to another area of data processing. The study, conducted by Schenley Imports (New York, NY), also revealed that although they are happy with their jobs, 60 percent of industry employees are sometimes asked to work weekends. Those who said they never work weekends expressed the highest level of job satisfaction. And counter to stereotyping, only 35 percent of all computer professionals said that their leisure activities involved computers. The study also revealed that creativity is perceived as the single most important aspect of the job, while paperwork was cited as the chief complaint. Although 78 percent of computer professionals majored in math, science, engineering, or a computer-related field, the study found that 77 percent believe that traditional English skills are very important to the pursuit of their careers. The Dewar's survey polled a sample of three hundred computer professionals in six different job categories: educators, systems analysts, programmers, consultants, entrepreneurs, and salespeople.

☐ Microcomputers, development systems, software, peripherals, and innovative applications are five of the product groups that will be represented at the Hannover Fair, to be held at the World Market for Electrical Engineering and Electronics in Hannover, West Germany, April 4–11. Overall, more than six thousand companies are expected to exhibit at the Hannover Fair. For more information, contact Delia Associates: Box 338, Whitehouse, NJ 08888; (800) 526-5978.

☐ Personal Computers in the Clinical Laboratory, a forum for medical professionals interested in using computers in their work, will be presented at the Duke University Medical Center March 29–30. For more information, contact Michael Bishop at the Medical Technology Program, Box 2929, Duke Medical Center, Durham, NC 27710; (919) 684-6015.

☐ Computers and Young Children, a national conference for teachers, administrators, and researchers in preschool and early childhood education, will be held April 5–6 at the University of Delaware in Newark, Delaware. The conference will feature hands-on workshops and speakers from the Children's Television Workshop and the Apple Education Foundation. A computer show open to the public will follow the conference. For more information, contact Dr. Richard B. Fischer, the Division of Continuing Education, University of Delaware, Newark, DE 19716; (302) 451-1171. ■



Glenn Ochsenreiter, Waldenbooks' software buyer.

EVERYONE'S GUIDE TO ASSEMBLY LANGUAGE

BY JOCK ROOT

Introduction to the Monitor

When your Apple is running a word processing program, it becomes a word processing computer; when it's running a game program, it becomes a game computer. You could even say that when it's running an XYZ program, it becomes an XYZ computer (whatever that is). But what is the Apple when it's not running any program at all?

It's turned off, that's what: turned off or broken. If a computer is working properly, it's *always* running a program—even when it doesn't seem to be doing anything at all. Inside that motionless box, the microprocessor is working very fast: executing several hundred thousand instructions every second. All of those instructions have to come from somewhere. . . .

Or you can look at it this way. If the Apple isn't working on a job you've given it—computing such and such or running so and so—then it must be waiting for an input from you to tell it what to do next. The Apple is so complex (or, in another sense, so simple) that it needs a program even for a task like "wait for an input."

Well, let's be fair. It's also doing something else, and a pretty complicated something at that. It's managing the screen image, keeping track of the spaces that could display 960 characters of text (40 by 24); and the fact that most of them are displaying ASCII 32, the space character, doesn't make it any easier for the Apple.

Thus, even when the system is "not doing anything," it's running a program. This month, we are going to examine that "not doing anything" program—which actually does some very important things. It's called the System Monitor, or simply the Monitor program.

The Mind in the Brain. You probably think of your Apple as a machine—a very sophisticated machine, born of high technology and state-of-the-art design, but still a machine—a collection of circuit chips, a piece of hardware. It is that, of course; but it's also more than that. A computer is not just hardware; it's hardware *and a program.*

You see, hardware is limited; it can only do one thing at a time. A piece of hardware may have several different functions (like an AM/FM radio, or a food chopper/blender), but it has to be set up differently for each of them. It has to be reconfigured by the user for each different function.

The Apple, on the other hand, can reconfigure itself whenever you tell it to. It can respond to your input with a whole series of actions, not just one, and it can even give you a different series of actions for a different input. A computer deals in sequences of actions, not single actions.

The reason is, of course, that the computer is controlled by a program—in effect, a list of instructions. When it finishes a task, it doesn't have to wait for another input from you. Instead, it looks at the list to find the next task and goes to work on that. It is "thinking" all the time, even when it doesn't seem to be doing anything.

This is a powerful arrangement. It's part of the reason your Apple can do such complicated things so quickly. However, it imposes one essential requirement: There must *always* be a program available. The moment the system is turned on, it starts looking for instructions, and they had better be there! If the microprocessor does not find the right kind of instructions, in the right place, then the whole system will lock up and refuse to do anything at all.

The answer to this problem is simple: The computer has a program built into it, in permanent or *read-only* memory (ROM). This program is always available when the computer is operating, so the system can always get instructions from this program whether another program has been loaded or not. This built-in program is the Monitor.

So What Does it Do? The Monitor takes care of "automatic" activities, things that must go on all the time but that don't require attention (like breathing and the heartbeat in your body). These include managing the screen image and listening to the keyboard, as well as a number of other management tasks. These activities are simple and repetitive, but essential—the computer equivalent of washing dishes, emptying wastebaskets, and making fresh coffee when needed. In computerese, these are called *housekeeping* activities.

In addition to the most routine tasks, the Monitor also handles the most extreme emergencies. When everything else crashes, the Monitor is left in control of the system. For example, turning the system on counts as an extreme emergency; everything in the system has to be set to a predetermined starting condition before anything else is allowed to happen. The Monitor contains detailed instructions for that, stored where the microprocessor expects to find them.

Another kind of emergency is the reset command. This is a hardwired "emergency stop" signal that makes the processor stop what it's doing and start over. The Monitor contains the instructions for starting over and can customize that process to give different results for different programs. It also handles the processing of interrupt requests, which are similar to a reset but less urgent.

In addition to managing dull routines and desperate crises, the

Monitor can help you write programs in assembly language. It can display the information in a specified area of memory and allow you to change that information—somewhat like the peek and poke commands in Basic, but more powerful. It can display memory data in the form of an assembly language listing and in some older Apples (before the II Plus), the Monitor included several useful debugging aids.

Finally, the Monitor is a valuable resource even when it's not doing anything directly. Some programs are so complex that they take over most of the Monitor's responsibilities when they are running, but they can also use most of the Monitor's abilities to perform those tasks. Your programs can use the Monitor as a subroutine library. You can make any Monitor capability a part of your own program by calling it as a subroutine.

You can think of the System Monitor as the "everything else" program—everything the Apple does, if it isn't following your specific instructions (or running a program you told it to), it does under instructions from the Monitor. Even when another program is running, such as Applesoft or DOS, it's using Monitor subroutines. The Monitor is the ultimate "system manager" in your Apple; it tells the whole system exactly what to do under any conditions.

By the way, most versions of the Monitor, as listed in the Apple reference manuals, have Steve Wozniak's name on them. When you're working with the Monitor, you're about as close as you can get to the "original" Apple—the machine that Woz designed for his own use. It's a pretty powerful machine.

Talking To It. Actually, you're using the Monitor all the time; all of the Apple's input and output goes through Monitor subroutines. But suppose you wanted to talk to the Monitor directly, to use some of those assembly language programming tools we mentioned. How would you do that?

That question has two answers. Getting in touch with the Monitor is easy, but knowing how to talk to it is something else entirely. It has its own "language," or command set, and its own way of doing things (quite different from Basic). For a complete description, see chapter 3 of the *Apple II Reference Manual*, or chapter 5 of the IIe *Reference Manual* (which is different from the *Applesoft Programmer's Reference Manual* for the IIe).

To get in touch with the Monitor, type *call −151*. The Applesoft prompt "]" will be replaced by the Monitor prompt "*", and the Monitor program will be waiting to interpret your input.

Don't let the minus sign of the call address confuse you. It means that this address is 151 spaces this side of the last possible location in memory. You can type the command as *call 65385* instead, if you find that easier to remember. To Applesoft it's the same number, but Integer Basic, which was the standard language in the earliest Apples, couldn't understand numbers higher than 32,767, so −151 emerged as the standard form of that address.

Okay, now you have its attention. What can you say to a System Monitor?

Command Syntax. To begin with, the Monitor thinks backward. When you want to tell it to "Do so and so here," you have to say, "Here, do so and so." The address comes first, and then the instruction. Sometimes you need to type several addresses and then an instruction; the Monitor is into addresses a lot.

Note that these addresses are always in hexadecimal numbers, not decimal. Hexadecimal numbers are base sixteen, instead of base ten. We'll explain the reasons behind this some other day; for now, just remember that the way to count in hexadecimal is 1 2 3 4 5 6 7 8 9 A B C D E F 10, and so on. We usually put a dollar sign in front of hexadecimal numbers to distinguish them from decimal numbers: 9=$9, 10=$A, 15=$F, 16=$10, 17=$11, and so on.

A two-digit hexadecimal number, such as $01 or $FF, can represent one byte of information: the unit or "word" of data that the computer works with. Each byte can represent a number, a letter, an instruction, or something else, depending on context. Most of your conversations with the Monitor will be about bytes and addresses.

Addresses are usually given as four-digit hexadecimal numbers, like $1234 or $0300 or $FFFF. If you're familiar with assembly language programming, you know that addresses sometimes have to be in reverse order, low byte first, within a program; but that does not apply to Monitor instructions. The Monitor understands addresses in normal order, high byte first, just as we humans do.

One more point about the Monitor and numbers. It only understands hexadecimal numbers, but it does *not* use the dollar sign prefix. We humans need that prefix, because we're likely to use both decimal and hexadecimal numbers in talking about a program, and we have to know which is which; but the Monitor interprets every number as hexadecimal, so the prefix only confuses it.

Now we know two things about Monitor syntax: The address comes before the command, and the address is in hexadecimal (but without a dollar sign). That's all we need to know, for now, except for one warning: Be careful with spaces!

Spaces are not allowed within a command (between the address and the instruction, for example). Monitor syntax uses the space as a separator; it marks the end of one command and the beginning of the next. You can put several commands on one line, if they are separated by spaces, but you cannot include a space within a command, since the Monitor will treat that as two separate commands.

The return key does the same thing in the Monitor as it does in Basic: It marks the end of a statement. It says to the Apple, in effect, "That's what I want. Now do it!"

What's Stored At. . . ? The simplest Monitor commands are concerned with examining memory. To see what is stored at a particular address in memory, type that address, then press return. You don't even have to tell the Monitor what you want. If you just give it an address, with no further instructions, it assumes you want to know what's stored there. It will respond by typing the address again, and then the data.

For example, if you want to see the contents of address 8192 or $2000, the beginning of the hi-res screen, the exchange would go like this:

```
*2000
2000- 00
*
```

After the first prompt (*), you typed the address, $2000 (without the $, and with no spaces), and then pressed return. The Monitor responded with the address and the byte stored there, and then gave you another prompt. In this case the stored byte is zero, which means that that part of the hi-res screen is black.

If you then press return again—no address, no command, just return—you will get this:

```
*2000
2000- 00
*
 00 00 00 00 00 00 00
*
```

This is called a *memory dump*; it's a partial listing of the contents of memory, according to certain rules. We'll explain those rules in a moment, but first suppose that you pressed return once or twice more. You'd start getting lines like this:

```
2008- 00 00 00 00 00 00 00 00
*
2010- 00 00 00 00 00 00 00 00
*
```

and so on—one line (followed by a * prompt) for each return. The address $2000 is the beginning of the hi-res screen; in this example, it looks like the hi-res screen is all black.

Notice the pattern: Each line begins with a four-digit number, which is followed by eight two-digit numbers. Also, all the four-digit numbers end in either 0 or 8. This is the standard form for a memory dump: eight bytes to a line, preceded by the address of the first byte, and always starting on an address ending with 0 or 8.

The first two lines were nonstandard because the Monitor hadn't gotten into its standard cycle yet. When you give it a single address and a return, as we did to start with, it assumes you only want that one byte of data—that was our first exchange. If you give it another return, it will finish that group of eight (up to the last byte before the next 0 or 8 address). Further returns will produce standard lines with a starting address and eight bytes of data.

You can also dump a whole range of memory—many lines—with a single command. To see all the bytes from address $300 to $320 (that's

768 to 800, decimal), type *300.320* followed by return: the lower address, a period, the higher address, and then return (no spaces). This will give you a memory dump of four standard lines and a fifth line with only one byte, the one at $320, in it.

By the way, the name memory dump is slightly misleading. This process does not affect the contents of memory at all—it doesn't dump anything out of memory, it just lists what's there. You can dump a section of memory as often as you want, and the data will still be there for you to dump it again.

Let's Store Something New. Now you know how to read data from memory using Monitor commands, but suppose you want to write data instead. How do you enter new information—for example, an assembly language program—into memory? The commands for that are also very simple.

Let's go back to the first form of the "examine memory" command, where you type an address and then return, and the Monitor responds with the byte stored at that address. If you type another return at this point, you'll get some more bytes of memory, as we described; however, there's something else you can do instead.

When the Monitor displays the requested byte, you can type a colon (:) and then a number (any hexadecimal number from $0 to $FF, but without the dollar sign), and then return. The Monitor will write that number into the specified memory location, erasing what was there before. If you now type (same address) return again, the Monitor will repeat the address, followed by the byte you just stored there—the new contents of that memory location.

If you have just done a memory dump of several bytes, and you type *:27* after the next prompt, the value $27 will be stored in the last location that was dumped—in other words, $27 will replace the last byte in the line above the prompt. This can be confusing—it's safer to use this technique when you have only dumped a single location.

If you like, you can combine these two steps into a single operation. When you type an address, a colon, a value, and return, the Monitor will simply store that value at that address. It would look like this on the screen:

```
*300:FF
*300
0300- FF
*
```

The first line stores $FF at $300, the second line asks to see what $300 now contains, and the third line says it contains $FF, as expected.

This technique does not show you what was stored in $300 before you wiped it out by writing $FF on top of it, but in many cases you don't care what was there before, so it doesn't matter. If it does matter, you can ask to see the byte before you destroy it.

You can use a slight variation of this technique to store a whole series of bytes in one step. As you remember, the Monitor uses the space character to separate commands. Here is where we take advantage of that. If you type

```
*300:0 1 2 3 4 5
*
```

the Monitor will store $00 at $300, $01 at $301, and so on up to $05 at $305. You can enter up to eighty-five bytes at a time this way. If you need to enter more than that, simply start the next line with another colon (after the * prompt) and continue entering bytes, like this:

```
*300:0 1 2 3 4 5
*:6 7 8 9 10 11
```

and so on.

Syntax Again. We started out by telling you that the typical Monitor command consists of an address followed by an instruction—and then, as our first example, we gave you an instruction that didn't fit the pattern. The normal command syntax calls for an address, followed by a command, followed by a return, but we started with just an address followed by a return, with no command between them.

That command, the one-byte memory dump, is an exception to the rule. It's the most frequently used of all the Monitor commands, so it was stripped down to the absolute minimum—just an address. You can think of this as the default Monitor command. When you type an address, this is exactly what the Monitor will do with it, unless you specify something else.

For example, in the *change memory* command, you can specify something else by typing a colon. The colon is a Monitor command that says, "In the memory location just specified, put the following byte(s)." The colon must be followed by a number from $0 to $FF (0 to 255), and that must be followed by either a return or a space and another number.

When you use the colon to begin a command, without specifying an address first, the Monitor will assume you mean the next address after the one you just loaded. Many of the Monitor commands work this way: If you enter the command without an address, the Monitor will continue from where it finished the previous command.

Other Commands. There are several of them, but we're running out of space. We'll mention a couple more, just to whet your appetite, but we'll have to leave detailed coverage until next month. If you can't stand waiting, we refer you once again to your Apple reference manual.

The *list* command is easy to use and quite safe. You can't get into trouble using it (Murphy, avert!), and it can show you some interesting things. It gives you a display of memory contents in the form of an assembly language listing, starting at a specified address. The command is L, and the syntax is normal; for a listing starting at $300, type 300L. This will give you a screenful of assembly language.

The go command is just as easy to use, and quite dangerous. You can crash the system with it. However, there's no harm in that—just turn the system off and back on again, and it'll come up unharmed. Go is the Monitor equivalent of run in Basic; it starts executing the instructions in memory, beginning at the specified address. This is how you run an assembly language program from the Monitor after you've loaded it.

If you must live dangerously, the command character for go is G and the syntax is normal: *address* G, no spaces. Be sure to include an RTS instruction, return from subroutine (the equivalent of Basic's return statement), at the end of your program to return control to the Monitor. If you don't, you'll crash for sure!

That should be enough to keep you busy until next month. See you then!

REPORT ON NEW PERIPHERAL HARDWARE:

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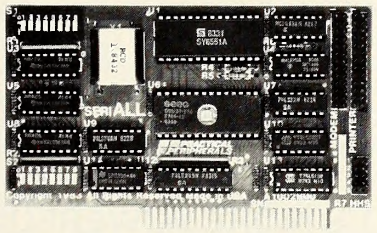

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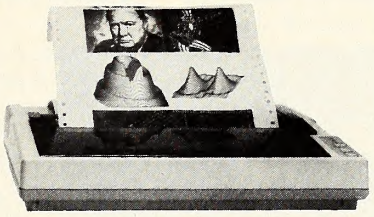

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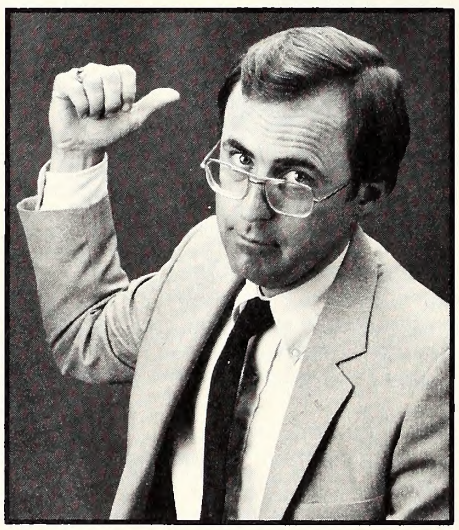

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Mind Your Business

BY PETER OLIVIERI

Graphics, B.U.G.s, and New Developments in Appledom

Getting into Graphics. Most of us like pictures. In fact, if we had to choose between having data displayed numerically or in the form of a chart or graph, most of us would probably choose the latter any day.

The terms "graphic" and "graphics" are used quite loosely in the microcomputer world. They may refer to a freehand drawing made by a child, to a business presentation of a company's projected sales, or even to a portion of a film such as *Return of the Jedi*. From our perspective, the use of graphics as an aid to business presentations is of primary concern.

In a business environment, data is often best represented as a chart or graph. The three most common ways of presenting data are bar charts, pie diagrams, and line graphs.

A line graph is the form of graphic representation that's most familiar to us. It is simply a connecting of points on a graph to form a line that represents the relationship between two variables. For example, a line graph may be used to display how a company's sales are increasing over time.

A bar chart (sometimes called a histogram) is quite similar to a line graph, but instead of using a line to represent how sales have been over a period of time, a histogram uses boxes or bars. The height of a given bar indicates the amount of sales for one of the periods being illustrated. Bar charts are more flexible than line graphs. By placing two bars side by side, for instance, you could illustrate how sales of two different items over the same time period compare. Or, if you wanted, you could design a bar chart in which an "income bar" and an "expense bar" were displayed side by side for each year being examined. This would show observers how revenue and expenses have compared over several years, as well as how they have compared within each year.

A pie diagram is used to display proportional data. For example, if you wished to illustrate how much of the total budget was being used up by each of your several expense categories, a pie diagram would be a very appropriate way to do so. As the name implies, a finished pie diagram looks like a pie. In our expense category example, the slices would represent each of the expense categories, and the size of each slice would be in proportion to that category's piece of the total budget.

In many cases, the difficulty in preparing good graphics presentations lies not with the particular hardware or software package being used but with the developer's ability to select the best type of graph to represent the data being presented. Sometimes this kind of discernment is acquired only after one has developed quite a few charts and graphs.

To be sure, there's much more to designing good graphics than meets the eye, but what meets the eye is important. If you're in the market for a graphics software package, you'd do well to consider the following:

1. Is the package easy to use? Does it come with good documentation?
2. Does it allow you to prepare graphics in color? If so, how many colors are available? Do the colors bleed into one another when displayed?
3. Can you mix text and graphics together on the same graph?
4. Is it easy to print a chart or graph? Can graphics be printed in color?
5. Is it easy to use your graphics in another program?
6. Can the original data be manipulated mathematically?
7. How long does it actually take to draw a graph?

These are just a few of the questions you might want to ask yourself when considering a graphics package. Of course, you'll also need to be concerned with hardware. Consider:

1. What kind of color monitor is most appropriate for this purpose? What degree of resolution is most desirable?
2. What input devices will you need? (You may wish to consider a graphics tablet, a light pen, a special keyboard, or even a television camera.)
3. What output devices would provide the best support for your display unit? (A color printer or plotter, videotape, instant picture camera, or large-screen projection unit are among the choices here.)

Much will be happening in the next few years to make the whole business of graphics a bit easier to deal with. In a sense, this has already started to happen. The graphics on the Lisa and on the Macintosh are outstanding. And many of the decisions there have already been made for you. There is no color, and very high resolution is available via the CRT that comes with the system. In addition, drawings can be incorporated into other applications and easily printed.

The future will bring laser printers and videodiscs, along with animation and special effects that are only dreams to many of us right now. And it's likely that most graphics packages will be part of larger, more complete computer software systems and that the standalone graphics package will become a thing of the past. Be that as it may, here we are in the present with a need to prepare graphics. What are our options?

Apple Business Graphics. Business and Professional Software's *Apple Business Graphics* can be learned with very little investment of time. It provides some powerful graphics capabilities, including easy design and display of bar charts, line graphs, and pie charts; the ability to manipulate data mathematically; and thirty extensive labeling features to use in customizing your graphs. This package should certainly be among the ones you consider.

PFS:Graph. If you're a PFS user, you may really need *PFS:Graph*. Of course, even if you don't use PFS, you can still use *Graph*; it works both as a standalone graphics package and as a vehicle to plot data developed with *VisiCalc* or *PFS:File*.

PFS:Graph is characterized by an ease of use and quality documentation that has become a standard for Software Publishing Corporation. The package provides only limited color and is not as flexible as *Apple Business Graphics*, but it is a good package nonetheless.

Charts Unlimited. *Charts Unlimited*, from Graphware, is a different kind of graphics package. It's designed to produce charts rather than graphs. You can use this sophisticated software to create, modify, and print professional-looking charts on a 123-column-by-90-row worksheet.

Included with the software are thirty-six predefined objects and various geometric shapes. These objects can be displayed, moved, stretched, shrunk, and replicated on your worksheet. In addition, there are thirty-six special symbols available, including math symbols and flow chart arrows. Text can be entered on a worksheet in upper or lower case and can be boldface or regular weight. The screen is a window that shows you one-sixteenth of the total worksheet. The feature called "view" allows you to condense the whole worksheet and display it in condensed form in one corner of the screen for viewing as you continue the business of creating your chart.

Charts Unlimited is a very nice product, and it uses the Apple in ways that are new and not often seen. The accompanying manual is easy to read and well organized, and it should help you become adept at creating a wide variety of charts. If you can visualize either a flow chart or an organizational chart, then you have some notion of what this program can do. And if you can visualize a chart that would be useful to you in your business, this program can help you create it.

Although it can be used by anyone who needs to draw charts, *Charts Unlimited* is particularly appropriate for engineers, programmers, systems analysts, and teachers. It's unique and well worth your consideration.

The Graphics Department. Sensible Software's *The Graphics Department* is not misnamed. This software really does begin to provide

users with their own specialized graphics department. Included in the package are four major modules and two support systems contained on three floppy disks.

The first module, the charting kit, allows the user to enter alphanumeric data and then to build a bar chart, a line graph, a pie chart, or a scatter diagram with a single keystroke.

The second module, the lettering kit, can be used to add titles, labels, or other lettering to any high-resolution picture. There are more than thirty different character styles, or fonts. These fonts come in five sizes and six colors, and they can appear on a chart in any of five different directions.

Module three, the graphics module, makes drawing ellipses, points, lines, and rectangles easy. In addition, picture sections can be transferred, merged, filtered, and reduced. And when you paint your pictures, you have more than one hundred colors to choose from.

The last module, the slide projector, permits you to display up to thirty-two hi-res pictures as a slide show. Pictures can be subtitled and shown at different speeds.

The two support systems are the file utilities and the printer interface. The file utilities module provides single-keystroke commands for loading, saving, unlocking, and generally managing the files you create. The printer interface allows you to incorporate a custom printer program for use with *The Graphics Department*.

The Graphics Department is easy to use. It may seem like we say that a lot in this column, but we only say it when it's true. This package has some other attributes that make it particularly attractive. To begin with, it's very complete. You can use it to create a variety of pictures (business charts as well as drawings) and to add customized text to your pictures, using an assortment of fonts and styles. In addition, it enables you to create almost anything you can visualize. Finally, it's fun. Many packages require more time and effort than the end result would warrant, but that's not the case here—*The Graphics Department* actually stimulates creativity. All in all, it has a lot to offer and rates your serious consideration.

If you're less concerned with the business use of graphics and more interested in creating unique art and pictures, various other products may be worth looking into. Among these are three packages we'll describe next time—*The Complete Graphics System* and *Special Effects*, from Penguin Software, and *The Graphics Solution*, from Accent Software.

Apple III Things. The biggest news here is the fact that Apple recently came out with the Apple III Plus. The enhanced Apple III offers a clock/calendar function, a IIe-type keyboard, a newly designed interface board for use with graphics, a better power supply, and an improved motherboard. In addition, there's a Driver's Aid disk to acquaint users with the way device drivers are used with the Apple III. Contact your dealer for details.

Some of you may not realize that in the fall of 1982, Apple released a new version of SOS. The new SOS is called, appropriately enough, SOS 1.3. It has a new set of device drivers and is available from your dealer.

If you're concerned about the fate of the III, relax. Apple is committed to this product. In fact, rumor has it that the III is the most widely used machine within Apple itself. And it happens that the III is enjoying a steady stream of sales, many of which are coming from current users who are pleased with their original systems and who wish to add machines to their work environment.

Lisa's Place. The Lisa has recently undergone some significant changes. One enhancement is a new operating system that markedly increases the speed of the machine. In addition to making this software change, Apple is incorporating a 3½-inch Sony drive and an optional internal hard disk into Lisa.

Apple has reduced the price of the Lisa by several thousand dollars. In addition, Lisa has been "unbundled." This essentially means that you can buy just the pieces you want.

LisaTerminal is a new software package from Apple that allows Lisa to communicate with other computers. It allows your machine to emulate a VT100, a VT52, or a TTY. You use it with your own modem. One of *LisaTerminal*'s nice features is that it can be run simultaneously with one of your other applications. Furthermore, this package takes full advantage of Lisa's mouse.

Apple's Cluster Controller allows the user to connect several personal computers. For example, with the Controller you might turn seven Apple IIs into an IBM 3270 network of terminals. The Controller works with either Apple IIs or IIIs and Lisa.

Current and future Lisa owners will be interested to know that several vendors—including BPI Systems, Open Systems, Solarsoft, and Aardvark—have developed or are developing applications for this machine. In addition, Apple plans to have a good deal of compatibility between Lisa and Macintosh via a terminal emulation package designed to allow users to run Macintosh programs on the Lisa. On the flip side, one can develop Macintosh applications on the Lisa and download them to the Macintosh. Look for Lisa to become a very popular machine.

Utility Programs. A few columns ago, we asked B.U.G. members to let us know about any utility programs that they'd found particularly useful. Responses are just now beginning to come in. Merle Block of Chevy Chase, Maryland, has sent along a program he wrote that might be of use to you if you do a bit of programming yourself.

In printing out answers to a problem in columnar format, it is often desirable to be able to align the decimal points. Block's program will perform that task for you.

```
10 S = 8 : REM S IS THE DISTANCE FROM THE RIGHT MARGIN
20 T = 0 : REM T IS THE TOTAL OF THE NUMBERS READ IN
30 DEF FN A(K) = S - INT(LOG(ABS(K + .05))/LOG(10)) + (.5 * SGN(K))
40 REM THE LINE ABOVE HELPS ALIGN THE DECIMAL POINTS
50 REM THE NEXT FEW LINES READ NUMBERS AND PRINT THEM
60 FOR I = 1 TO 6
70 READ K
80 PRINT TAB(FN A(K));K
90 T = T + K
100 NEXT I
110 PRINT TAB( 5); "--------"
120 PRINT TAB(FN A(T));T
130 REM BELOW ARE SOME SAMPLE NUMBERS
140 DATA 1.2345, 2.67, 798.012, 0, -645.1, -0.543
150 END
```

Not very fancy, but it does the trick. Don't worry about how the program works; just try it out and see that it works. If you're able to try out this helpful little utility, you should have no trouble incorporating it into your own programs.

B.U.G. Assist. Edmundo Cardenas, of Caracas, Venezuela, recently asked B.U.G. members for help in getting his NEC 8023A-C printer to backspace and overprint a character in order to insert an accent. This task can be done from within a Basic program or when using some word processors. Eric Oshlo of Katy, Texas, provided a solution.

First, it seems, you must understand that the NEC won't recognize the backspace command if it is issued when the printer is in bidirectional mode (the normal default). The printer must be put into the incremental printing mode, and this must be done immediately following a return or the printer won't recognize it. Then a control-H (this is the backspace) must be inserted immediately after the character to be overprinted. Thus, an escape after a return is used to put the printer in the proper mode and a control-H causes a backspace; your accent character can then be inserted.

One problem that may occur: The accent mark may be too low and actually touch the character that it's accenting. While this can be handled, it's a bit difficult to do because of the keystrokes needed to control the one-half line feeds necessary to print the accent mark properly. Once the backspace has been executed, a reverse one-half line feed can be accomplished by pressing escape R, escape T12, and control-J. After the accent mark is printed, pressing escape F, control-J, and escape A will execute a forward one-half line feed and thus return you to the default line spacing of six lines per inch. The accent mark could be moved closer to the character by using some number less than 12 in the reverse line feed instruction above.

A second problem may be the actual creation of the accent character. This character is ASCII 96 and cannot be accessed directly from the Apple II keyboard. The Videx Enhancer II gives the user access to the full ASCII character set, so if you plan to work with many of the special characters that aren't standard with the Apple, you'll likely find this product of value. ■

Apple Computer, 20525 Mariani Avenue, Cupertino, CA 95014; (408) 996-1010. Business and Professional Software, 143 Binney Street, Cambridge, MA 02142; (617) 491-3377. GraphWare, 5084 Mosiman Road, Middletown, OH 45042; (513) 424-6733. Sensible Software, 6619 Perham Avenue, West Bloomfield, MI 48033; (313) 399-8877. Software Publishing Corporation, 1901 Landings Drive, Mountain View, CA 94043; (415) 962-8910. Videx, 1105 N.E. Circle Boulevard, Corvallis, OR 97330; (503) 758-0521.

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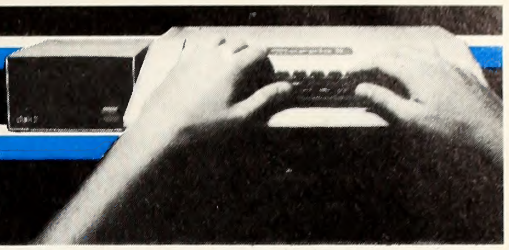


Unless otherwise noted, all products can be assumed to run on either Apple II, with 48K, ROM Applesoft, and one disk drive. The requirement for ROM Applesoft can be met by RAM Applesoft in a language card. Many Apple II programs will run on the Apple III in the emulator mode.

☐ **Howard W. Sams** (4300 West Sixty-Second Street, Indianapolis, IN 46268; 317-298-5400) has announced the publication of several new books. *Crash Course in Microcomputers, Second Edition*, is an updated introduction to computers. The book contains definitions and explanations of computer terms as well as a section on microcomputer applications. $21.95. *Megabucks from Your Microcomputer* explains how to use microcomputers to earn additional income. The book also offers advice on how to buy the right computer, and on how to write and market software, magazine articles, and product reviews. $3.95. *Soul of CP/M: How To Use the Hidden Power of Your CP/M System* explores the capabilities of the CP/M operating system. The book examines how CP/M works, what programs are available, and how they can be modified. $18.95. Sams has also announced a guide for programmers who would like to understand and write more advanced software. *Polishing Your Apple, Volume 2*, explores intermediate programming procedures. $4.95.

☐ **The Interface Group** (300 First Avenue, Needham, MA 02194; 617-449-6600) has announced several Computer Showcase Expos. Small systems, peripherals, software, services, and supplies will be exhibited for business, professional, and corporate users of small computers and word processing systems. Shows will be held in the following cities: Phoenix (Phoenix Civic Center, March 16–18); Miami (Miami Beach Convention Center, April 5–8); Saint Louis (AJ Cervantes Convention Center, April 12–15); San Diego (San Diego Convention and Performing Arts Center, April 26–29). Admission is $7.50 for all shows.

☐ **Habit Control Software Services** (750 Las Gallinas Avenue, Suite 218, San Rafael, CA 94903; 415-472-2155) has introduced software called the *Well-Being Series*. The first five programs are designed to help combat problems such as smoking, overweight, stress, poor study habits, and lagging self-confidence. $39.95.

☐ **The Negotiation Institute** (230 Park Avenue, New York, NY 10169; 212-986-5555) has announced a package called *The Art of Negotiating Computer Preparation Program*. The program takes the user through the negotiating process on his personal computer and may be used for both negotiation preparation and for negotiation training. The package was designed for the Apple III. $495.

☐ **Informatics** (21031 Ventura Boulevard, Woodland Hills, CA 91364; 213-887-9040) has announced an electronic mail system called Informail. Informail provides the user with an electronic mailbox for sending and receiving messages, five cents per message.

☐ **Microcomputer Workshops** (225 Westchester Avenue, Port Chester, NY 10573; 914-937-5440) has an educational courseware program called *Capitalization Plus*. It covers capitalization rules and generates more than eight hundred thousand different sentences. The database is changeable. $39.95.

☐ **Davka** (845 North Michigan Avenue, Suite 843, Chicago, IL; 312-944-4070) is introducing the *Bible Action Series*. One game in the series is *Jericho*, in which the player must avoid arrows of angry warriors and shoot blasts from Joshua's horn to topple the walls of the ancient stronghold. $29.95.

☐ **Ventura Educational Systems** (3440 Brokenhill Street, Newbury Park, CA 91330; 805-499-1407) has developed several educational software products. *Protozoa* is a learning system that presents data on four representative organisms in the Protozoa phylum. A microscope study unit is also included. $39.95. Four learning games are included in *Learning Potpourri*: word match, mouse math, drawing pad, and U.S. capitals. Word match is a memory game for two players; mouse math provides drill and practice in addition, subtraction, multiplication, and division; the drawing pad allows the user to create low-resolution pictures; and U.S. capitals provides practice in matching states and capitals in gameboard format. $39.95. *Robby the Mouse* is a micro book with graphic illustrations presenting the story of Robby the Mouse. Follow-up activities include a maze game, word match game, math practice game, and drawing pad. $39.95.

☐ **AgDisk** (624 Peach Street, Lincoln, NE 68501; 402-476-2811) has devised a computerized system of record keeping for farrowing operations called the *Swine Record Keeping Package*. The package is designed for use with herds of up to 300 sows. The documentation manual includes an example farrowing operation to guide users through the program. $600.

☐ **Associated Technology** (Route 2, Box 48, Estill Springs, TN 37330; 615-967-9159) is offering *dBase II Coding Guide*. The product was designed to help software departments formulate their own database standards for microcomputers. The *dBase* reference guide is recommended to software managers, designers, and quality assurance teams. $22. Associated Technology also has announced a manual that guides programmers in selling their own software creations. The seventy-eight-page manual gives information on how to obtain national directory listings, how to price a new software product, and more. $20.

☐ **Amphel Industries** (2888 Bluff Street, Suite 353, Boulder, CO 80301; 303-440-0411) has released *Amphel's Simple Condominium Billing System*, which is specifically designed for use by condominium associations and managers. The system is capable of handling up to 500 accounts per disk. $99.95.

☐ **Suncom** (650 Anthony Trail, Suite E, Northbrook, IL 60062; 312-291-9780) has introduced the System Station, a line of home computer furniture. The basic system starts at $79.

☐ **Dynatech Microsoftware** (7847 North Caldwell Avenue, Niles, IL 60648; 312-470-0700) is releasing *MenuWriter*, designed to load and run computer programs from menus. A single keystroke loads and runs any program shown in the menu. $29.95.

☐ **Terrapin** (380 Green Street, Cambridge, MA 02139; 617-492-8816) has announced version 2.0 of its Logo language. Version 2.0 includes the addition of six new primitives and several editor commands, full-function support for all four cursor keys, and the ability to read program files created using Apple Logo. $149.95.

☐ **Macmillan** (866 Third Avenue, New York, NY 10022; 212-702-4212) is publishing the *Easy Home Computer Series*. These guides explain how to set up, run, and expand a computer system. Together, they examine how various computers work and why they work the way they do. The first title for Apple is *The Apple IIe User's Guide*. $5.95.

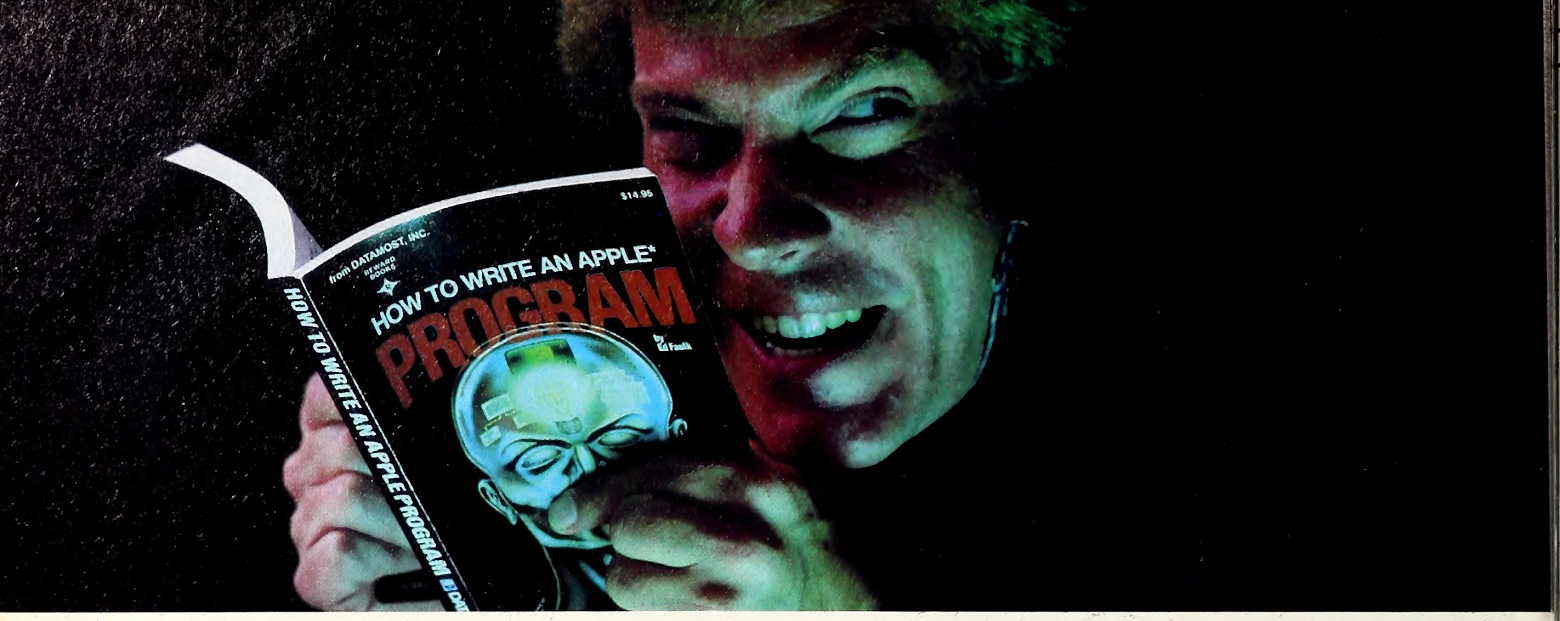
☐ **Misco** (404 Timber Lane, Marlboro, NJ 07746; 201-780-9299) is offering its Winter/Spring Catalog. The catalog offers computer and word processing supplies and accessories. Free.

☐ **Pericomp** (14 Horon Drive, Natick, MA 01760; 617-655-7660) has announced its *Superfile Backup* system. The package is designed for backing up CP/M or MS-DOS files and also backs up hard disk or floppy files of any size. $49.95.

☐ **A.U. Software** (Box 597, Colleyville, TX 76034; 817-267-5236) has announced *Exam Builder*, a test generation and storage system for teachers. The menu-driven program requires no prior computer knowledge. $99.95.

☐ **Pixel** (1066 Claredot Drive, Idaho Falls, ID 83402; 208-522-0447) is introducing a game called *Brain Storm*, a multiple-choice trivia quiz with about seven hundred questions on science, television, sports, politics, the world, the universe, the mind, literature, languages, music, art, history, famous people, the Bible, and more. $21.95.

☐ **John S. Kallend** (10 West Thirty-Third Street, Chicago, IL 60616;



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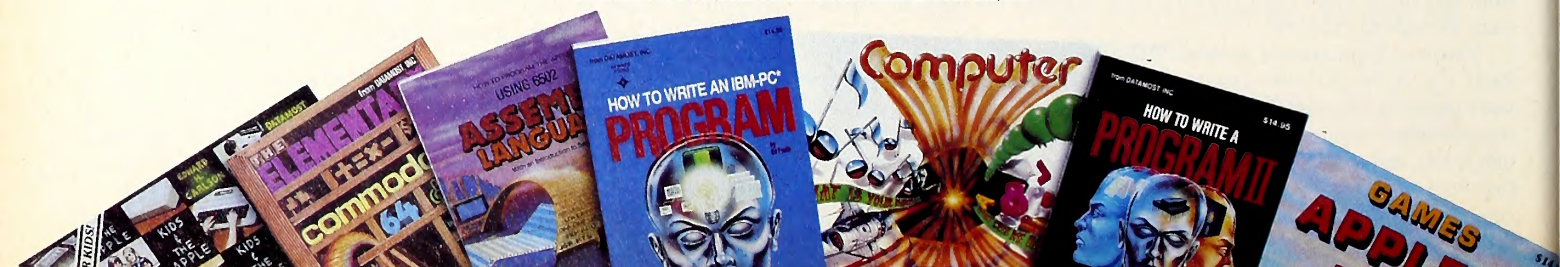


312-567-3054) has devised the *R/C Flight Simulator*. The program is designed to aid in the flying of radio-controlled model airplanes. It presents a 2-D graphic visualization of a model plane in all phases of flight, from takeoff to aerobatics and landing. $29.95.

☐ **CMA Micro Computer** (55722 Santa Fe Trail, Yucca Valley, CA 92284; 619-365-9718) has announced the release of two software catalogs. One carries the firm's new line of applications minipaks, a line of single-purpose business applications. The other features more than thirty of CMA's applications packages for the dental profession. Applications include specialized professional billing and claim form preparation, appointment scheduling, patient recall, and general ledger applications. Both catalogs are free.

☐ **Strategic Simulations** (883 Stierlin Road, Building A-200; Mountain View, CA 94043; 415-964-1353) is releasing a fantasy adventure game called *Questron*. The player's quest is to seek out the diabolical wizard, Mantor, purloin the Book of Evil Magic, and thereby save the Questron Empire. $49.95.

☐ **Thomas Wnorowski** (3352 Chelsea Circle, Ann Arbor, MI 48104; 313-971-1404) has produced the *National CBBS Directory* for all computer users who communicate by phone. The directory contains more than one thousand computer bulletin board telephone numbers, which are organized in numeric sequence. $2.

☐ **dilithium Press** (8285 S.W. Nimbus, Suite 151, Beaverton, OR 97005; 503-646-2713) has announced the publication of two books: *Golden Flutes and Great Escapes: How To Write Your Own Adventure Games* is a book that teaches potential game writers how to program. The book and software describe the process of designing and coding programs. $29.95. *An Apple for Kids* teaches children Basic programming and how to operate the Apple. The book uses a developmental approach to teaching programming skills with a focus on problem solving, improved thinking skills, and creativity. The book was written for children eight to thirteen years old. $7.95.

☐ **Data Management** (Box 4340, Wilmington, DE 19807; 302-655-8986) has announced a programming language called MAGIC (Machine Generated Integrated Code). The language was developed to increase productivity up to ten times. $795–$995.

☐ **Turning Point Software** (11A Main Street, Watertown, MA 02172; 617-923-4441) has introduced a personal/small business financial management tool entitled *Time Is Money*. The program was designed for persons with no accounting or bookkeeping background who want an accounting system. $100.

☐ **DEE** (Diversified Educational Enterprises, 725 Main Street, Lafayette, IN 47901; 317-742-2690) has released three new products. *Quiz* is a test-creating system. The product requires no programming knowledge and may be used to create true/false, multiple choice, exact answer, and short answer quizzes. $139.95. *Popgen* is an interactive program centered on the Hardy-Weinberg Law and the behavior of genes in populations. $60. *Popgro* permits students to explore population growth and the progressive refinement of scientific models. Students have an opportunity to manipulate variables. $60.

☐ **Reader's Digest Software** (Reader's Digest Services, Pleasantville, NY 10570; 914-241-5727) has introduced a line of learning games for the home. *Alphabet Beasts & Co.* is a child's game that teaches the alphabet and numbers. Colorful graphics along with a musical rhyme appear on the monitor when the child presses an alphabet key. $34.95. *Little People's Puzzles/Nursery Rhymes* is a preschool game that features puzzle pictures from eight different nursery rhymes. $39.95. *Things That Go* is also a preschool game featuring puzzle pictures of a car, airplane, sailboat, hot air balloon, rocket, train, and truck. Children select a picture from one of four levels of difficulty and try to assemble it. $39.95. *Micro Habitats* is a game designed for children six to twelve years old. The object is for the child to decide what kind of plant and animal life should populate environments such as an underwater garden, outer space, and the jungle. $39.95. *Puzzle Mania* presents video images on a screen that replace traditional cardboard pieces of a jigsaw puzzle. The program features seven different puzzle pictures, and users may pick from six levels of difficulty. $39.95. *Speedy Spids* is an arcadelike game that helps users remember facts and other bits of information. Designed for seven- to seventeen-year-olds, the program comes with nine different fact files covering arithmetic and grammar skills. $39.95.

Trickster Coyote is for ages eight and up. It provides practice in reading and defining words, and in matching them with appropriate synonyms. The program is equipped with 300 words. $39.95. *Key Lingo* is an adventure game that provides practice in associating words with their meanings and usage. $39.95. *Chambers of Vocab* is a game that reinforces spelling skills and knowledge of word definitions. The game is designed for nine-year-olds and up. $39.95. *Cogito*, designed for all ages, is a thought-provoking game for two players. The object of the game is for the players to avoid bankruptcy. $39.95.

☐ **Anchor Automation** (6913 Valjean Avenue, Van Nuys, CA 91406; 818-997-6493) has introduced *Volksmodem*, a computer device designed to simplify inventories and cut costs, as well as meet demands for data transmission with personal computers. $79.95.

☐ **Infocom** (55 Wheeler Street, Cambridge, MA 02138; 617-492-1031) has published the *InvisiClues* hint booklet. The book is designed to provide customers with suggestions, support, and reinforcement, as well as increasing game-playing pleasure. A step-by-step system is provided to aid players in arriving at gaming solutions. $7.95.

☐ **The National Computer Shows and Software Expositions** (824 Boylston Street, Chestnut Hill, MA 02167; 617-739-2000) is planning a Personal Computer Userfest May 3–6 at the O'Hare Exposition Center in Rosemont, Illinois. The Userfest consolidates Applefest for Apple computer users and PC '83 for IBM PC owners. The show will feature Apple, IBM, and "work-alike" computers, including accessories and software. Admission is $10 for a one-day ticket or $20 for four days.

☐ **M & M** (636 Waverly Street, Palo Alto, CA 94301; 415-328-1114) has announced *CoinMinder II*, a computerized record-keeping and inventory system designed specifically to serve the needs of coin collectors and investors. $179.95.

☐ **KA Design Group** (6300 Telegraph Avenue, Oakland, CA 94609; 415-654-6300) has announced the Turbo Stick, a joystick offering high pointing speed, high resolution, and full RS-232 ASCII output for interface. The handle of the Turbo Stick incorporates two fingertip-operated microswitches that allow the user to switch between absolute mode, with high pointing speed, and a rate mode, with high resolution. $395.

☐ **Cascade Graphics** (1000 South Grand Avenue, Santa Ana, CA 92705; 714-558-3316) recently previewed its *Cascade I* drafting/graphics system. *Cascade I* is a computer-aided design system used to produce construction drawings. $895.

☐ **Bizcom/84** (155 Front Street, Manchester, NH 03102; 603-669-1250) has been planned for March 9–11 at radio station **WKBR** in Manchester, New Hampshire. Bizcom/84 is a computer and communications show that will cover the latest in computer software, as well as professional and business applications. General admission is $2.

☐ **Business Machines and Systems** (Box 965, Bolinas, CA 94924; 415-868-2012) has announced *Gencalc Accounting Spreadsheet*. The system allows the user to take data and financial reports from *BPI System General Ledger* and transfer them to a *VisiCalc*-like spreadsheet. $95.

☐ **International Computer Programs** (9000 Keystone Crossing, Box 40946, Indianapolis, IN 46240; 317-844-7461) has announced the seven-volume *ICP Software Directory*, a comprehensive listing of microcomputer software. $395–$550.

☐ **Inmac** (2465 Augustine Drive, Santa Clara, CA 95051; 408-727-1970) has announced the release of the thirty-fifth edition of its *Computer Accessory Catalog*. The catalog contains computer products and supplies. Free of charge.

☐ **Synapse Software** (5221 Central Avenue, Richmond, CA 94804; 415-527-7751) has announced a product to be released in late spring 1984 called *Relax*. This is the first program in a series of personal healthware titles. It is designed as a stress-reduction system. $89.95.

☐ **Software Publishing** (1901 Landings Drive, Mountain View, CA 94043; 415-962-8910) will enter the communications market in May with *PFS:Access*. The communications software package provides data encryption and enables users to access information, timesharing, communication, and home banking services. $70.

☐ **Omega Engineering** (One Omega Drive, Box 4047, Stamford, CT 06907; 203-359-1660) is introducing thermocouple and RTD transmitters. The transmitters are designed to minimize the effects of noise and signal degradation, to which low-level sensor outputs are susceptible. $160.

☐ **Tellus Systems** (Box 96588, Houston, TX 77213; 713-455-2191) has announced two new products. *Quick-Draw Adventure Mapper* is a companion utility to adventure games. *Mapper* will print a summary and a high-resolution map of your adventure on a dot-matrix printer. $39.95. *Bubble-Head* is an arcade game with sixteen mazes, force fields, and trick doors. $19.95.

☐ **Dialogue Systems** (770 Broadway, New York, NY 10003; 212-475-3900) has designed *Personal Computers: An Executive Self-Study Program*. This course provides information about business applications of personal computers. $275.

☐ **Zephyr** (306 Homewood Avenue, Pittsburgh, PA 15208; 412-247-5915) has a mini-file system called *Cat*Man*. The system allows the user to input author, title, and subject for each book, record, or tape in a collection. Up to 2,000 items can be catalogued. $19.95.

☐ **Monument** (Village Data Center, Box 603, Joshua Tree, CA 92252; 619-365-6668) has announced the release of a catalog and *Electroboard 2.0*. *Electroboard 2.0* is a business and educational graphics package that allows the user to develop graphics and screen animation for business presentations and educational slide shows. $139.95. The company's educational catalog includes more than twenty-five applications for the

SCRG

SWITCH-A-SLOT

The **SWITCH-A-SLOT** is an expansion chassis, which allows the user to plug in up to four peripheral cards at one time. One of these cards is selected for use, and only that card draws power.

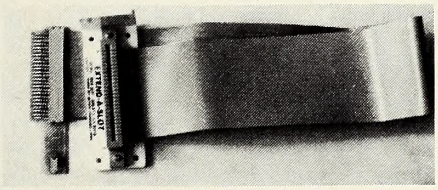
This product is especially useful where the software requires the printer to be in a particular slot, and the user wishes to choose between two or more printers.

- Allows up to four peripheral cards to be plugged into one peripheral slot.
- User selects desired card by front panel rotary switch.
- Only selected card draws power.
- Plugs into any peripheral slot.
- Saves wear and tear on delicate connectors.
- 18" cable connects Switch-a-slot to computer.
- Accommodates cards up to 10¼" long.
- All connectors gold plated.

$179.50

SWITCH-A-SLOT and EXTEND-A-SLOT work well with all slow to medium speed cards, such as Modems, Printers, Clock, 80 Column, Music, etc. They are not recommended for high speed data transfer devices such as disk drive controllers, alternate processor, and memory cards. These products may be incompatible with some alternate processor cards.

EXTEND-A-SLOT



The **EXTEND-A-SLOT** brings a slot outside your APPLE™, allowing an easy change of cards. The 18" flex cable is long enough to allow placement of the card in a convenient location. The high quality connectors are gold plated for reliability.

The perfect accessory for:

Owners of large numbers of I/O expansion cards—keep your frequently used cards installed. Use the EXTEND-A-SLOT for the others.

Technicians—easy access to test points on accessory cards under actual operating conditions.

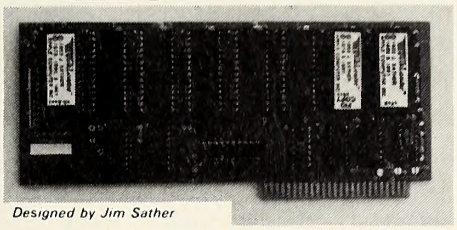
Experimenters—make easy changes to cards while card is installed.

EASY TO USE—just plug it in as you would any expansion card, then plug your card in. When you want to change cards, do it easily outside the computer, without the wear and tear on the computer expansion slot.

$34.95

NEW PRODUCT

quikLoader



Designed by Jim Sather

SPEED

The quikLoader is the *fastest* way to load programs, ***BAR NONE!*** Applesoft, Integer, or machine language programs can be loaded in fractions of a second. More importantly, DOS is instantly loaded every time the computer is turned on. Integer is even loaded in the language card. This process takes less than a second, saving valuable time. The quikLoader operating system can keep track of over 250 programs stored in **PROM**s (Programmable Read Only Memory). The user simply transfers any of these programs to PROM using the instructions packed with the unit, and any PROM programmer, or we will provide this service.

CONVENIENCE

How many times have you started to work with a frequently used program, only to find that you have misplaced the disk, or worse, had the disk damaged, or the dreaded "I/O ERROR" message flash on the screen. With the quikLoader, these nightmares can be a thing of the past. Frequently used programs are available *instantly* when you need them, without having to look for the disk, or hoping that the lengthy disk loading procedure goes smoothly. If you do need to use standard disks, the quikLoader even speeds up that process. For example, to catalog a disk, just press ctrl-C Reset. To run the "HELLO" program, press crtl-H Reset.Other "one-key" commands include entering the monitor, booting the disk, calling up the mini-assembler, etc. The major difference between the quikLoader and the other ROM cards is the complete operating system (in PROM). This enables you to get the quikLoader catalog on the screen (by pressing ctrl-O Reset), allowing you to see what programs are available. Loading or running of the desired program requires one keypress. Program parameters, such as starting address and length of machine language programs can be seen on the catalog screen, if desired.

VERSATILE

The quikLoader will accept any of the popular PROMS available on the market, 2716, 2732, 2764, 27128 and 27256. These types may be freely intermixed on the card. Long programs can take up more than one PROM, or several short programs may be stored on one PROM. The quikLoader operating system even handles multiple cards, so you can easily double or triple the amount of PROM memory available. The ultimate memory capacity of one card is 256K, so many frequently used programs and utilities can be stored. We even start your library of programs with the most popular utilities on the card, FID and COPYA. Now, if you have to copy a disk, you don't have to search for the master disk. You can start copying within 3 seconds after turning on the computer.

INCREASED DISK CAPACITY

Since DOS is loaded from the quikLoader every time the computer is turned on, it is not necessary to take up valuable disk space with DOS. This will give you more than 10% additional space for programs and data on your disks.

SYSTEM REQUIREMENTS

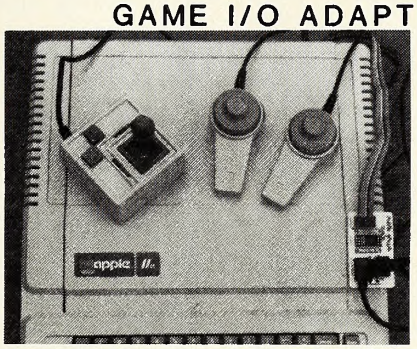
The quikLoader plugs into any slot of the APPLE] [+ or //e. If used in a] [+, a slightly modified 16K memory card is required in slot 0. A disk drive is required to save data.

DOS, INTEGER BASIC, FID, and COPYA are copyrighted programs of APPLE COMPUTER, INC. licensed to Southern California Research Group to distribute for use only in combination with quikLoader.

$179.50

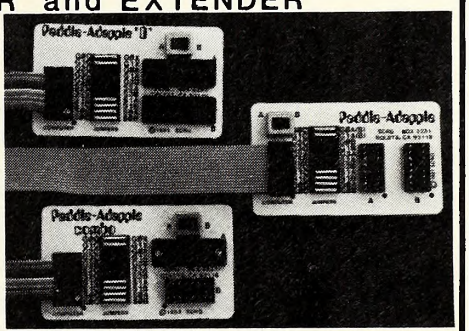
Paddle-Adapple

GAME I/O ADAPTOR and EXTENDER



- Works with all Apple compatible joysticks, paddles and other I/O devices.
- Select one of two devices or . . .
- Use 4 paddles simultaneously.
- Unique "Jumpers" socket allows you to configure to meet your needs.
- BPI™ users can have BPI™ device and paddles plugged in simultaneously. (**Paddle-Adapple** and **Paddle-Adapple Combo** only).
- Gives you four push-button inputs.
- Supports shift key modification.
- Exchange X & Y joystick axis.
- Small and compact — adheres to computer with supplied foam tape.
- All Strobes, annunciators and power available on all 16 pin connectors.
- Supplied with 18" cable.

$29.95



The **Paddle-Adapple** has two 16 pin sockets.

The **Paddle-Adapple "D"** works with the subminiature D connectors.

The **Paddle-Adapple Combo** has one 16 pin socket and one subminiature D connector.

D MAnual controller

This hardware product gives the user complete control over all I/O functions in the range $C000 through $C0FF. For example, you may switch between text and graphics; hi-res and low-res; turn disk drive on and off, etc.

D MAnual controller allows all this while programs are running. Commands can be issued (via push-buttons) in the middle of a program, and the desired result occurs immediately. The process used (known as CYCLE STEALING) allows immediate execution of these commands without interfering with the normal operation of the program. The card is slot independent, and is connected to a control panel by a four foot cable.

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school administrator or educator. The catalog is free.

☐ **The BBS Directory** (Box 4215, Beach Station, Vero Beach, FL 32964; 305-466-5515) is now available. The directory is a listing of bulletin boards in North America. It offers more than seven hundred listings by state, area code, and make of computer. $5.95.

☐ **The Institute of Industrial Engineers** (IIE Conference Department, 25 Technology Park/Atlanta, Norcross, GA 30092; 404-449-0460) will offer its sixth *IIE Manager's Seminar* March 12–14 at the Hyatt Regency in New Orleans, Louisiana. The course is structured to focus on management goals, productivity tools, and obstacles facing industrial engineering professionals. $435–$495.

☐ **Stallion Software** Box 42821, Department 704, Houston, TX 77242; 713-242-0288) is offering the *Professional Tax Consultant*. The program is designed for calculating federal income tax and printing out IRS-approved forms. $100.

☐ **Bible Research Systems** (9415 Burnet Road, Suite 208, Austin, TX 78758; 512-835-7981) has announced another version of *The Word* processor. The program contains the complete text of the King James version of the Bible. The latest version allows the user to add comments to the printed output and to cross-reference indexes in Bible sequence or in a user-controlled sequence. $249.95.

☐ **Osborne/McGraw-Hill** (2600 Tenth Street, Berkeley, CA 94710; 415-548-2805) has released *SuperCalc Home and Office Companion* and *Advanced Pascal Programming Techniques*. *SuperCalc* is written for both inexperienced and advanced users and offers more than sixty *SuperCalc* models. $15.95. *Advanced Pascal* describes techniques for programming in Pascal. The reader is shown how to design, code, test, debug, and modify Pascal programs. $19.95.

☐ **Adaptive Software** (1868 Cavell Avenue, Highland, IL 60035; 312-831-4420) is introducing the *Expense Account Manager*, a software package designed specifically to organize and track travel/entertainment expenses for the company executive and individual professional. $150.

☐ **Video Visions** (7 Waverly Place, Madison, NJ 07940; 201-377-0302) has announced the release of the VAI-135, a videodisc/computer interface. The product allows computer control of most consumer laser videodisc players. The VAI-135 is an external interface that plugs into the Apple's game port and does not interfere with joystick operations. $125.

☐ **Educational Systems** (1000 Skokie Boulevard, Wilmette, IL 60091; 312-256-4750) has released Microref reference guides for *SuperCalc*, *Multiplan*, and *VisiCalc*. $14.95.

☐ **Wayne Green Publications** (Peterborough, NH 03458; 603-924-9471) has published two new books: *Rainbow Quest* is a children's book that combines fiction with computer games. The fantasy tale can be combined with accompanying game software. $24.97. *Low Cost Costing: Product Costing with Your Microcomputer* offers step-by-step instruction in using a microcomputer for generating profit-and-loss statements. It contains nine programs developed by the author. $24.97.

☐ **Electronic Specialists** (171 South Main Street, Natick, MA 01760; 617-655-1532) has introduced a new catalog focusing on products designed to eliminate problems blamed on software. Free.

☐ **Arthur D. Little** (25 Acorn Park, Cambridge, MA 02140; 617-864-5770) has just published *Computer Insecurity*. The book is made up of past computer incidents, ranging from larceny perpetrated by programmers to people who are victimized by computers. $25.

☐ **Micro Program Designs** (5440 Crestline Road, Wilmington, DE 19808; 302-738-3798) has introduced the *Stock-Folio* system. Designed for experienced and beginning stock investors, the program is controlled by menu selection. $79.50.

☐ **N-Squared Computing** (5318 Forest Ridge Road, Silverton, OR 97381); 503-873-5906) is marketing the *Internist*. The program is designed for members of the medical/health professions interested in performing differential diagnoses with the aid of a personal computer. $95. The company is also releasing an interactive graphics diet-analysis program called *Nutritionist II*. The software also features a cost, food exchange, and exercise and activity program. $295.

☐ **Three Sigma** (Box 716, Morrisville, PA 19067; 215-295-3339) has announced several new products. *Secret of Easter Island* is a mystery game. The object is for the player to save Easter Island from volcanic devastation via a mysterious idol. $30. *Fireware Pinball* is composed of three hi-res pinball games on one disk. $30. *Space Spikes* is an adventure game requiring a joystick. The object of the game is for the player to defend himself against various deadly space objects. $20. *Vegas Video* was designed to sharpen the user's gambling skills. The game also features an animated Vegas strip. $20. *Game Pak* includes *Adventure*, *Tic Tac Toe*, *Craps*, and *Blockout*. It features two-player games with the computer or another player as the opponent. $15. *Personal Financial Planner* is a package designed for personal financial matters. It includes analysis of savings, real estate, and insurance, as well as a confidential projection summary. $25. *Service Club Secretary* is a software program designed for record keeping. It can be utilized for membership rosters, attendance records, phone numbers, fines, and other functions. $25. *Computory* provides business managers with a means of recording and reporting the inventory and assets of an operation. $25. The first of a series of Biology I laboratory instructional programs is *Frog Dissection*. It is designed to assist the student in preparing for the lab and provides an in-lab tutor and reference guide. $45. The *Gene Scene* is a human genetics educational game designed to teach players basic principles of Mendelian genetics and make players aware of the emotional, ethical, and financial considerations that must be faced during genetic counseling. $45. More than three hundred synonyms and antonyms are contained in the *SAT Review*. The program is designed to prepare students for the SAT examination. $50. *Math Reviewer 1.2* teaches mathematical concepts to high school and college students. With color graphics, it includes lessons on exponents, trigonometry, metrics, and more. $50.

☐ **Business Solutions** (Sixty East Main Street, Kings Park, NY 11754; 516-269-1120) is releasing *Jack2*, a software product that does word processing, spreadsheeting, charting, and database management tasks on the same screen at the same time, without windows. $395.

☐ **The Instructional Resource Center of the City University of New York** (535 East Eighteenth Street, New York, NY 10021; 212-794-5425) is offering a conference entitled Microcomputers and Basic Skills in College, scheduled for April 13-15 at the Vista Hotel in New York City. Preconference workshops include word processing, software evaluation, Basic, Logo, and graphics in CAI. $95.

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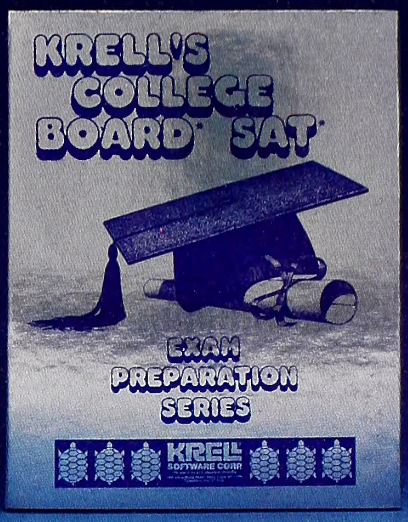

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42 program series. Complete coverage of all SAT* topics including The Test of Standard Written English. All materials presented in SAT* format and at the same level of difficulty encountered in SAT* Exams. Scoring and explanations provided instantly. Krell's unique logical design customizes this multi-disk set for each individual user. *Beware of imitations!* **$299.95**

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CONNECTIONS

Krell's *Connections* is the most exciting development in educational computing since LOGO. *Connections* offers children of all ages a new world of entertainment and intellectual challenge. Parents and educators will be gratified by the intriguing yet serious nature of *Connections*.

Connections is accompanied by an initial set of data bases (included free with the game system) that deal with geography, chemistry, mammals, mathematics, tools, and everyday objects. *Connections* helps users to build their own data bases and to utilize the data bases created by others via the *Connections User Group Exchange Program*, 48K. **$99.95**

KRELL'S LOGO

The M.I.T. authorized version. Comprehensive 4-disk set includes two copies of LOGO for Apple II™, all utility programs and Sprite drivers, all M.I.T. demonstration programs, shape editor, music editor, 21 program *Alice in Logoland* Tutorial Series, and massive documentation including full color wall chart. THIS IS THE GENUINE ARTICLE! Unlike the version marketed by Apple Corporation, KRELL'S LOGO offers the full package of M.I.T. features including the ability to save pictures.

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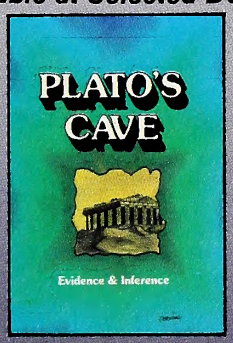

New! ALEXANDER THE GREAT

Available at last!!! *Alexander The Great* is the ultimate game for developing word and arithmetic skills, far better than Scrabble™. *Alexander The Great* permits equal competition between players at different skill levels. Complete graphics and range of options make *Alexander The Great* the best and most challenging, educational tool ever devised. Available for all microcomputers and in a board version, 48K **$39.95**

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Spectacular game for aspiring scientists of all ages. Players probe *Plato's Cave* with light beams as they explore the relation between illusion and reality and the relation between evidence and inference. Graphic, dynamic, and challenging, with difficulty levels suitable for all, 48K **$49.95**

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☐ **Scarborough Systems** (Twenty-Five North Broadway, Tarrytown, NY 10591; 914-332-4545) has published three new products: *Phi Beta Filer* is a multipurpose management program with household applications. It incorporates the use of both color and sound as it sorts and prints list materials. *PatternMaker* is an art and mathematics program that facilitates the study of geometry and the creation of patterns for architectural and craft use. *Run for the Money* is an educational business game allowing two players to sharpen their business skills and strategy in an alien environment. $39.95–$49.95.

☐ **Curtis** (Twenty-Two Red Fox Road, Saint Paul, MN 55110; 612-484-9183) is releasing an accessory card for the Apple II series computers called Romdisk. Romdisk allows a user to store a full disk of program files in EPROM memory. $499.

☐ **3M** (Box 33600, Saint Paul, MN 55133; 612-733-9572) has introduced a desktop computer protection pad called First Touch. The pad is designed to protect computers from the harmful effects of operator-induced static electricity. $69.95.

☐ **PRC of America** (475 Boulevard Street, Elmwood Park, NJ 07407; 201-796-6600) is offering the Data Vault. This product is designed as a floppy disk mailer so that computer data may be protected in the mail. $20.

☐ **Vernier Software** (290 S.W. Eighty-Ninth Street, Portland, OR 97225; 503-297-5317) has announced seven programs for use in introductory physics classes: *Orbit II*, *Graphical Analysis II*, *Vector Addition II*, *Kinematics II*, *Projectiles II*, *Charged Particles II*, and *Wave Addition II*. The programs are designed to assist the teacher by providing demonstrations, lab simulations, data analysis, and problem-solving for the student. Each program sells for $24.95.

☐ **Transwestern** (1711 Senter Road, San Jose, CA 95112; 408-279-2544) has announced an uninterruptible power supply for personal computers. The Ultraguard series has an AC-powered unit, which is a battery-backed-up power source for use with small computer systems and instruments that must remain operational during power blackouts. $649.

☐ **The Regents/ALA** (Two Park Avenue, New York, NY 10016; 212-889-2788) is introducing *Quizit*, a program for creating mini-quizzes. The program can be used to create exercises or quizzes on an Apple computer. $39.95.

☐ **Aztec Electronics** (12345 Westminster Avenue, Santa Ana, CA 92703; 714-554-1730) is marketing Touch-N-Turn, a swivel and tilt stand for computer terminals or monitors. The stand is designed so that the user may view the screen without bending his neck or straining his eyes. $59.95–$69.95.

☐ **American Association of Individual Investors** (655 Third Avenue, New York, NY 10017; 212-661-8030) has published *Microcomputer Resource Guide for the Individual Investor*. The book contains information on microcomputer hardware, investment software, financial information services, and timesharing systems, as well as reviews of books of special interest to investors with computers. $16.

☐ **Pryor** (400 North Michigan Avenue, Chicago, IL 60611; 312-644-5650) has released the Winter 1984 issue of its computer and word processing supplies catalog. This catalog carries a special section on hard-to-find products for personal computers. The catalog is free of charge.

☐ **Sensible Software** (6619 Perham Drive, West Bloomfield, MI 48033; 313-399-8877) is releasing a reference management system called *Bookends*. The system is designed as a card catalog system that enables the user to track down articles, magazines, and books. $124.95.

☐ **Micro MD Publishers** (Box 2500, Chesapeake, VA 23320; 804-424-5800) is now publishing a newsletter for physicians and other health-care professionals called *Micro MD Journal*. The publication provides information on microcomputer applications. $36 annually.

☐ **U-Microcomputers** (300 Broad Street, Stamford, CT 06901; 203-359-4236) has introduced U-nscrump/2. The package is a software protection card that plugs into any of Apple's expansion slots. $12–$40.

☐ **Chessell-Robocom** (111 Pheasant Run, Newtown, PA 18940; 215-968-4422) has available a brochure entitled *Now You Can Draw Literally Anything with Your Apple II Computer*. The brochure gives information on the Robographics CAD-1 and tells how designs are created and modified, images stored, and drawings recorded with a plotter. Free.

☐ **PICOtronics** (820 East Forty-Seventh Street, B-10, Tucson, AZ 85713; 1-800-431-5007) is introducing an electronic security system for the protection of microcomputers. The Data Defender is placed underneath the computer system to provide protection. An alarm alerts the owner when computer equipment is in jeopardy. $198.50.

☐ **Simon & Schuster** (1230 Avenue of the Americas, New York, NY 10020; 212-245-6400) has introduced *Typing Tutor III*, an advanced touch-typing instruction program. The program records the student's response time on each key and uses it to modify subsequent lessons to adjust for the student's speed, error rate, and keys learned. $49.95.

☐ **Micro Format** (1271 West Dundee Road, Suite 16A, Buffalo Grove, IL 60090; 312-537-2426) is releasing a product for splicing continuous computer forms called a Micro Format Splicing Board. The board is utilized when you have breaks in continuous forms or want to change common size forms that are running through the printer. $34.50.

☐ **Aquarius** (Box 128, Indian Rocks, FL 33535; 813-595-7890) has published a catalog of educational software. The catalog lists a range of software products that cover the areas of early learning, basic skills, mathematics, and language arts. Free.

☐ **Sterling Swift** (7901 South IH-35, Austin, TX 78744; 512-282-6840) is marketing a software package to help teach the fundamentals of football. *50 Defense Vs Run* consists of two disks, each with three lessons and a coach's manual. $99.95.

☐ **Videx** (1105 Circle Boulevard N.E., Corvallis, OR 97330; 503-758-0521) has released the *Videx Uniprint Parallel Card*. The product provides Apple computer users with a parallel interface card, as well as graphic transfers of hi-res pages. $89.

☐ **The New Hampshire Association for Computer Education Statewide** (NHACES, Computer Services, Stoke Hall, University of New Hampshire, Durham, NH 03824; 603-862-3527) is planning its third annual Computers in Education conference for Friday, April 6. $100–$140.

☐ **Rabcom** (Box 10266, Stamford, CT 06904; 203-356-9879) has a new publication entitled *Computer News Digest*. The bimonthly publication is a compilation of computer news recorded on audiocassettes. $195 a year.

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GOTTA DANCE!

TERPSICHOREAN APPLE TAKES CENTER STAGE

BY MICHAEL FERRIS

The animated figure in the DOM notation program (left) takes a bow for its creator, dancer Eddie Dombrower (right).

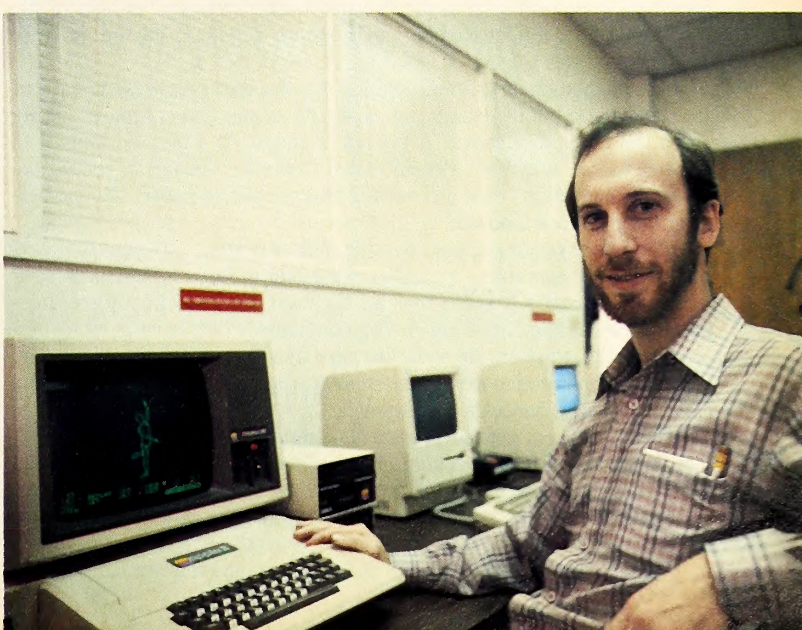
The magic of dance moves always ahead. It reaches above and beyond; like in love, like in faith, the artist must adventure, never look back.

—Helen Obolensky

Soon after his leap to freedom in 1961, Russian ballet dancer Rudolph Nureyev was asked to perform Fokine's *Le Spectre de la Rose* on German television, in a program arranged by Swiss ballet master Vaslav Orlikovsky. *Le Spectre* is a role made famous at the turn of the century by Nureyev's great predecessor, Vaslav Nijinsky. Both dancers had been tutored at the Kirov Ballet in Moscow.

Nureyev was under tremendous pressure at that time, according to biographer Clive Barnes. "He was not told what to do, he was expected to know the Fokine choreography, which he had never seen." So Nureyev crammed. "He studied a few photographs of Nijinsky and, with a little help from a few friends, improvised and hoped for the best." Somehow, it worked.

For the next seventeen years, Nureyev shied away from the piece. In 1978 he performed it in New York with the London Festival Ballet. He



had obviously read more on Nijinsky, notes Barnes. "In this Beriosoff staging," he writes, "Nureyev made wonderful use of the weaving, Oriental *ports de bras*—those tendril-like arm movements, like art nouveau traceries—the big leaps, the delicate beaten steps, and, of course, the famous arabesque pencheé against the chair. He was a spirit, a poem, an image never quite lost . . . he was a rose with a difference, one with all the style to recall that marvelous Cocteau poster of Nijinsky in the very role."

Put On Your Red Shoes and Dance the Blues. Not only was Nureyev's a rose with a difference, it was a different rose. The choreography of Nijinsky's rose was never recorded, either on paper or on film. And Nureyev was never able to go back to the Kirov and hunt down an elder dancer who had seen the legendary Nijinsky perform the role.

The passing on of the choreography to a dance is an oral tradition in the dance world. Precious few works are committed to paper—the Bureau of Dance Notation lists around three hundred, and most of those are classical ballets. That's why the ephemeral art form of dance is called the illiterate art, even by those who practice it.

In contrast to Nureyev's dance dilemma, the music that accompanies

Le Spectre de la Rose—Invitation to the Dance, written in 1819 by Carl Maria von Weber—was available in sheet music form in Nijinsky's time and continues to be available more than 150 years later.

Only one piece of Nijinsky's original choreography survives. His scandalous *Faune*, with its "two-dimensional, frieze-like choreography" and "suggestion of erotic rites and wall paintings," is part of the repertory of the Ballet Rambert of London, England, passed on from dancer to dancer.

Many schemes of written notation for the dance have been created over the years, but the task is not as simple as that of a composer jotting down the notes to a score. A current standard is a method known as Labannotation, a symbol system called "specific enough to record the flutter of an eyelash" that can make a dance look, on paper, like the baffling floor plan of a house.

Using the system requires considerable expertise. "Ninety-five percent of the dancers today are either not going to learn Labannotation or have developed a dislike for the concept," says choreographer-programmer Eddie Dombrower. Big companies don't have as much of a problem with notation, he adds, because they have all their old dancers around. "The problem is with the smaller, regional companies and in the early stages of a dancer's development.

"When dancers get older, instead of retiring to a life in the country, they retire to a life of teaching," says Dombrower, who's committed to advancing dance literacy with his DOM (Dance on Microcomputer) Notation System, a 3-D animation program for notating and creating dances.

"Older dancers teach classes in technique and variation, or repertoire," he explains. "They pass on choreography by a word-of-mouth notation system."

That's the way it's always been in the dance world and despite advances in film, video, and written notation, that's the way it's likely to stay for some time—unless Dombrower's Apple software has any influence.

Under the Moonlight, the Serious Moonlight. When you pass a billboard touting a top-selling piece of software—right up there in the sky alongside America's auto, bottled water, and sport shoe icons—you know you have entered Palo Alto, California, the town that bits built.

Nestled among rugged eucalyptus trees, planted decades ago as wind breakers when the land was a farm, Stanford University does not go untouched by all the microcomputer commerce raging around it. Innovations from the valley influence all university departments, from computer science to electrical engineering. One area of influence would surprise some: Few people realize that Apples can dance.

The dance division at Stanford is part of the athletics department. "Just like all the other departments, we're exposed to the advances of Silicon Valley and aware of the computer's influence," says Diane Freccero, dance division coordinator. "Why should dance be left out?" Indeed.

Freccero plans to incorporate Dombrower's software into her notation course, using it to demonstrate the future of dance notation. She also plans to compose on it herself, seeing it as "something to enrich the process of choreography," she says—a process she admits is something of a blessing and a curse. With the entire tradition of dance to fall back on, she doesn't feel she'll be "boxed in by shapes on the screen."

Philosophically, she adds, "One would rather shape the future than be shaped by it, so we dived right into using computers." Which is how dance instructors came to be pulling boards out of Apples at Stanford.

Four years ago, a graduate student in dance (and a statistics major) performed his thesis concert based on a mainframe computer program he'd written that incorporated chance elements into composition. The result, in a dance titled *Cavinu*, was random selection of movement. Choreography had met the computer.

The first time micros were used as part of the curriculum was a children's dance workshop last summer. Fourteen young dancers, six to twelve years old, would spend an hour working on choreography, then march over to the campus computer center to sit in front of some personal computers. Using a simple drawing program, they were instructed to diagram their dances. "The results weren't stick figures, as one might expect," says instructor Elizabeth Larkam, "but floor pattern sketches complete with rhythm and music notes."

This year Larkam, codirector of children's dance, rolls an Apple on a cart into her weekly modern dance and rhythm and movement classes. The youngsters put down their drumsticks, shakers, and bells to poke at

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the keys of a new kind of instrument. Some are eager—they press any key to begin. Some are shy and wait to be shown what to do—just as they did when they were chosen to beat out a rhythm on a big bass drum. At this age, any machine can be intimidating.

Fall into My Arms and Tremble like a Flower. What the children are attempting to do is make the wiry, three-dimensional figure in Dombrower's Notation System move and turn. With varying degrees of success, children make the figure move its arm or leg, bend forward, or execute a full 360-degree turn. They find it most exciting when they can get the figure to do things a real human being can't, like turn an armless cartwheel or walk away from its head.

After the demonstration, Larkam polls her students. They say they would rather watch a real person dance, but that it was fun on the computer. What they're all too young to realize is that what's fun for them today might be tomorrow's software for choreography and dance notation.

The DOM software is a tool for both learning and designing dances. It works like a frame-by-frame animation camera, run by a simple arrow system with full-sentence commands. Even the most advanced use—choreographing a dance—takes only a few minutes to learn and involves memorizing only a few extra commands.

Written in machine language, the program runs in conjunction with a board designed by Dombrower's partner, Mike Lopez, a biomedical engineer who also has a hearing aid and a car alarm system to his design credit.

"The math board freed up my work," says Dombrower. True animation would require a million to a million and a half calculations per second. Some unconventional math tricks on Dombrower's part, in combination with Lopez's board, speed up the calculating process to simulate the real-time, CAD-CAM-like animation of the central figure. The board also serves to copy-protect his software, since the program won't run without the handmade device in slot 3.

The system works like a word processor. A user places the figure into a position he wants from the keyboard, using the arrow keys or punching in the number of a desired angle. The position is then saved, and each step becomes part of an animated dance phrase, able to play back at six frames per second.

The original menu-driven version of the program, used by Stanford until last month, held eighty-five frames of movement. Dombrower's current version holds more. "That first version held ten to fifteen seconds of movement in memory before it had to go back to the disk," Dombrower explains. "The current system holds 25 to thirty." The next version will include a condensing routine that will allow three to five minutes of finished dance "even in a 48K machine."

"A dancer normally learns only fifteen to twenty seconds of movement at a crack, and learning from the screen isn't as tiresome as turning pages."

Demonstrating the program, Dombrower happens upon a particular position he likes and saves it to a special disk. That's one of the random beauties of his system. "It's real easy to pussyfoot around in the program, as soon as you know how it works," he says. He is saving steps to incorporate into a dance.

When You Say Run, I'll Run with You. These days, Dombrower is a wanted man. When Larkam read about his work in a national magazine, she was determined to hunt him down. It was Larkam who proposed Stanford as the first test site for Dombrower's program. He was delighted.

"We saw Eddie's program as a beginning," says Larkam. "It's a step on the way to composing dance on a computer. Ultimately, we envision a system with many figures available to manipulate in many ways to compose a dance. Unless there's some active support of the DOM system now, that may never happen."

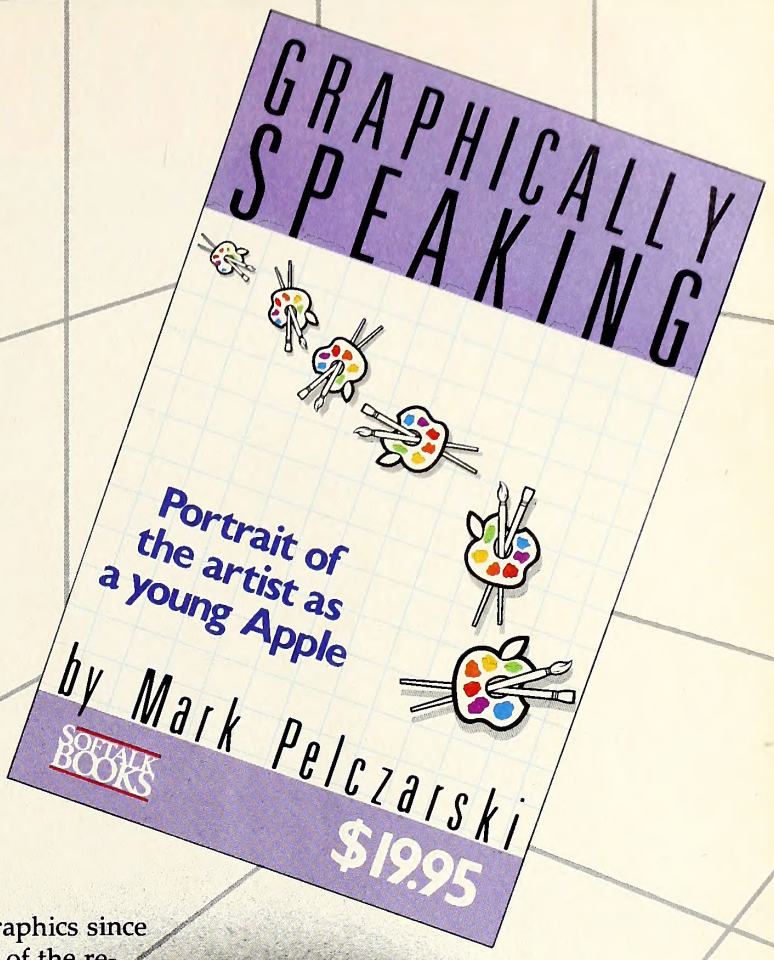
Larkam will expand its use in her classes to include having the children designing dances with steps they've created on the Apple, or having them interpret dances they see on the screen. The dance division sees the DOM system as a multifunctional learning package. Since it was introduced late in the school year, only Larkam is using it at present. Next year, as part of the full curriculum, the program will get a workout.

What surprised Dombrower most about Stanford's eagerness to try his system was their keenness to use it as a tool for choreography. "Originally, I was tentative about saying you could design dances with it. Computers are still an unknown bird in the dance community." They won't be for long.

Sway through the Crowd to an Empty Space. Typically, a choreographer will map the flow of a dance first, then go back in and create movement phrases. Using the DOM system, "They can go back into the program after having doodled, and they don't have to exhaust a live dancer until they get the move they want," says Dombrower.Choreography by computer can also save a choreographer time and money. In a large company involved with current producion, development time and rehearsal space are at a premium.

On his way to a job as ballet master of the Stuttgart Ballet company, Allen Ebnother saw a demonstration of Dombrower's software on a television news show. Tremendously excited about the program's potential, he trailed it to Stanford and Larkam set him up with a session at the Apple. He liked what he saw and is recommending that the German company purchase an Apple.

"Choreography is a precise, mathematical art form," says Ebnother, a choreographer himself. Ballets are schematically diagrammed. "Even



MASTER GRAPHICS

Pelczarski has been involved with Apple graphics since before the Apple was a Plus and is the founder of the renowned company, Penguin Software. He has brought the techniques necessary for creating graphics to users throughout the continent with The Graphics Magician, The Complete Graphics System, and other equally sensational products. This is the man behind the hi-res screen. This is his animated book with a fascinating plot, colorful characters, deep perspective, and plenty of excitement.

The book covers everything from pokes to pixels, 3-D illusions to preshifted shapes, algorithms to Y-coordinates. Explore your Apple a bit further. Pelczarski unveils the world of graphics programming and explains the underlying concepts used to create some of the best arcade games in the world. Not only does the author provide the basics, he provides the machine language too. Along with the dozens of programs in the book, there is a clear and thoughtful explication of the graphic potential of your Apple computer.

And, if the plot loses you, the appendixes will come to the rescue. This is a learner's guide, a delightful collection of graphics routines and programs, and an excellent reference manual. Put something new on your screen. Stretch out and draw something.

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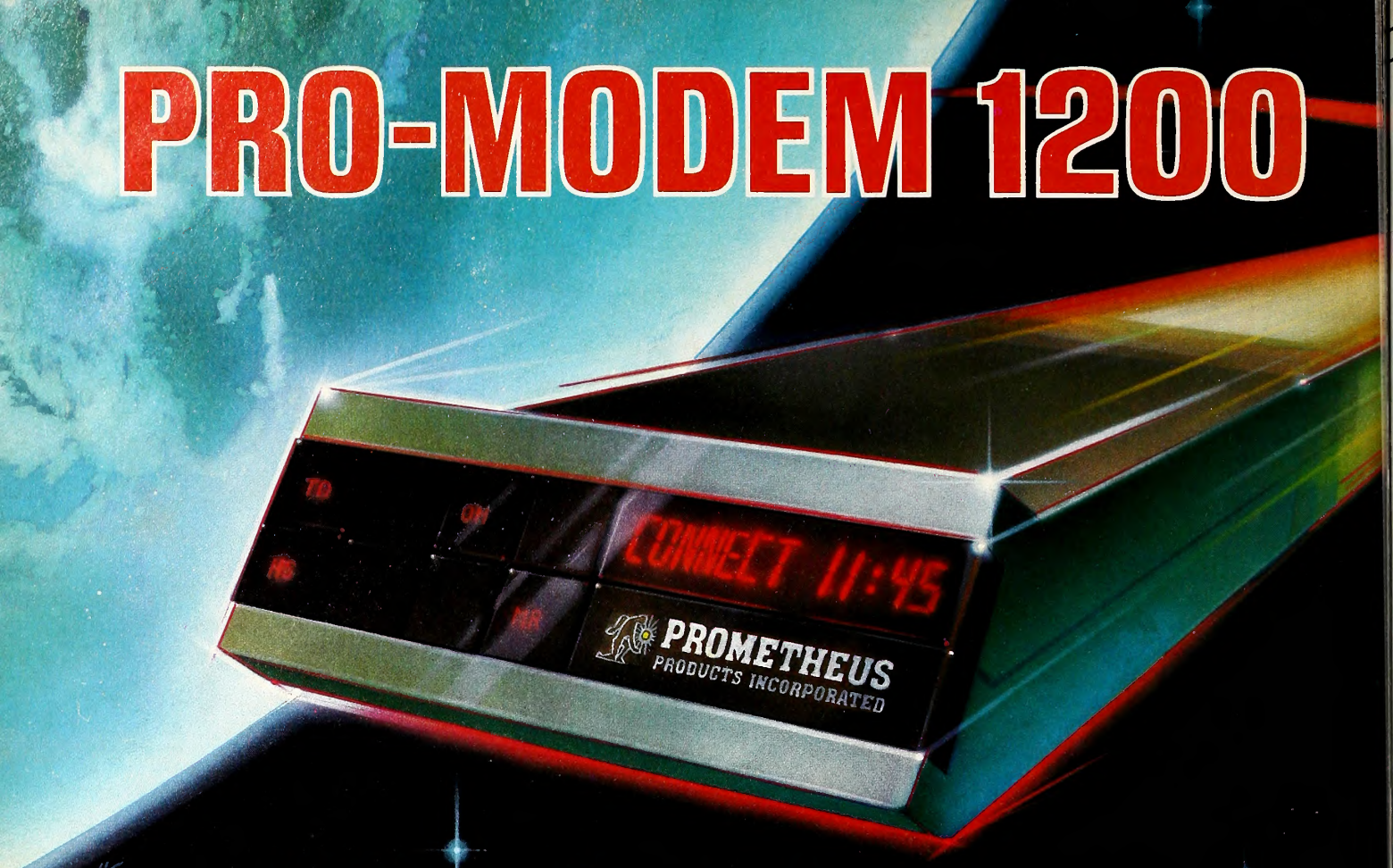

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PROMETHEUS

Stravinsky is broken down into eighths." What looks like a rhythmic flow of bodies and phrases to an audience is actually an elaborate set of hundreds of counts and beats, memorized by the dancers. Also, "most choreographers work alone and like to challenge themselves," he adds. Used to getting the most from the limits of a given piece of music, they would, he says, relish working within the limits of a new form, the computer.

All the pressure and attention he's getting these days sometimes gets Dombrower down. Time is tight. Money is tight. Holding down a nine-to-five job programming games for a major home video company and programming nights and weekends on his Apple is not his idea of a good time. "I like being with people rather than spending all my time with machines," he says. Although he's the type who likes to tinker with things and be "the handyman around the house," calling him a hacker makes him bristle.

What he's best at is improvising which, lately, has become his second job. "It's extraordinarily difficult" to be an entrepreneur on a shoestring, he says. "You won't find the software superstars of the world working on dance notation programming," like he and his partner Lopez are. There's not a mass market for the software he's created, and he has to go scratching for capital. Nonetheless, the dance community, as well as the press, has gone crazy for Dombrower's software. "It's a big responsibility," he says, holding up his end of the project, with the dance world "knocking at my door and asking me when it's going to be done."

To the Song They're Playing on the Radio. Eddie Dombrower was a dancer before he became a programmer, and the artist in him still remains. A suggestion that he combine his math and dance disciplines led him to creating the notation system software.

Funded by a postgraduate grant, Dombrower met his first Apple in England in 1980. Research for the grant showed that the only computer-related figure study work was being done "at the academic level and on military-priced, time-sharing computers, like modeling motion for the auto industry."

After learning the finer points of programming in apprenticeship, he started by modeling a rotating hand in Pascal. "I started with a finger, using very simple programs, and progressed to a full hand. There are as many joints in your hand as there are in the rest of your body," says Dombrower. "It was a real good exercise, using a lot of the same algorithms that are now in the finished product."

The format for the system came out of the necessity for debugging the figure graphics, he says, "not by design."

Returning to America, he converted his routines to machine level for speed and space reasons. He recommends working in assembly. "Anyone who is mechanically inclined, with a decent teacher or way to learn, is going to get a good enough feel for it to do assembly language programming," he explains, liking the ability to work within the actual architecture of the machine. Nevertheless, he admits it takes a "rare breed" to want to do it.

"Probably," he adds, "anyone who has good language skills can learn to program in a language," whether it be Pascal, Basic, or assembly.

"They don't call them languages for nothing. There's not only vocabulary or syntax, but there is something I would say is close to innuendo in the way you can structure your statements. It's not the same as in a human language, but you can develop the skill for putting things in a certain order so they mean slightly different things."

A point that irks Dombrower is the way the news media always say good math students make the best programmers. He was "a good math student, but never a great one." But it doesn't take being a stellar math student to program. "Anyone who is proficient in one discipline will have no trouble drawing parallels between their discipline and working with the computer," he says.

Not all programmers are "bits-and-bytes-type eggheads," an idea he's found even young children believe. "There's an artistic side to it that gets overlooked."

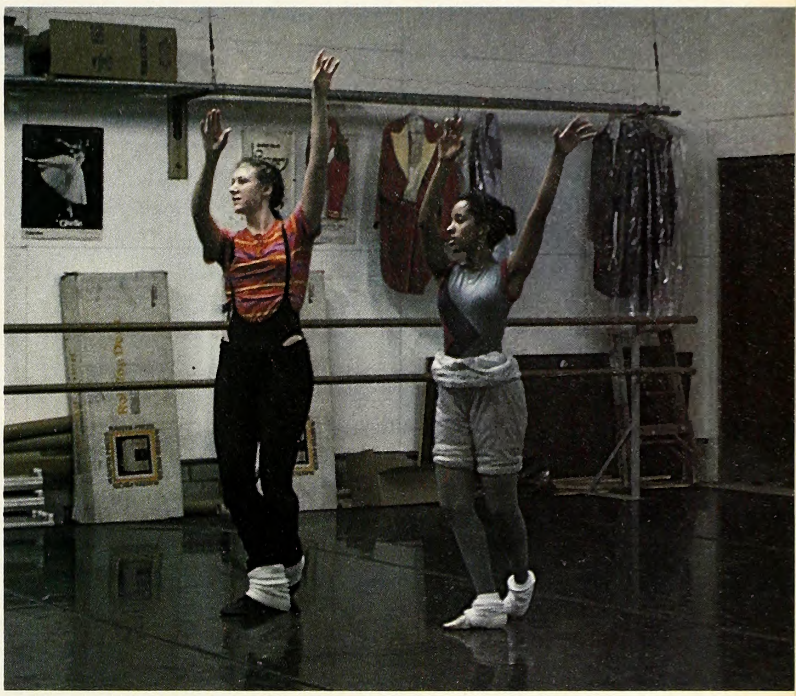
The burden of creativity on demand and the limits of his resources shut Dombrower down for a while, as they would any artist. "Things tend to go slowly sometimes, and that's frustrating," he says. "A good idea takes time, and what I'm working on is too valuable to be a quickie piece of work." So he waits until the blue funk passes and then dives back in, pushing himself further than before.

One of the things that brings him out of a slump is the fact that his program "is just a lot of fun" to a lot of people. "That always makes me happy, having been a performer for several years. It's nice when people are amused by something you can do. It's good for those depressing moments."

What's fun about Dombrower's software is its friendliness. Although it's a complex piece of programming, to the untrained user it's a delight to work with. "It's been used by a lot of people who don't have any expertise in the field," he says. "That's one of the sure signs a system is going to work."

With the new version of DOM installed at Stanford, Dombrower's next challenge will be to go back into the coding for the animated figure and clean it up. "When it moves too fast, some of the lines become broken and people have to use their imagination to fill in the figure's movement," he says. It's full of detailed trigonometric calculations. "I'm sure there are a few missed numbers causing it to do some of the things it does."

Let's Dance, Let's Dance, Let's Dance. Dombrower started dancing late and was able to bring an adult perspective to his early dancing years. "It was phenomenal to watch what was happening with all those



twelve-year-old girls I was in class with," he says. At their age, he had been studying to be a professional musician. "Their experience was totally different from mine. It's amazing.

"Young dancers have very little sense of repertory," he explains. "The one they have is produced by the studio director, a teacher, or an older student." It's like a junior high school orchestra conductor having to write all the music for the band, with no standards to lean on. "They don't get a well-rounded perspective of what they're heading into."

Also, a lot of good choreography doesn't get a chance to travel very far. It's performed regionally and very rarely passed on. Film technology has helped remedy this, although nowadays the first and foremost medium for recording dance is videotape.

"Videotape is doing a lot for the preservation and notation of dance," says Dombrower. Videodisc technology, with freeze-frame and playback capability, is an even more advanced step. "But it doesn't solve the problem totally. Take, for example, shooting large groups of dancers on a stage. You have to be far enough back to get them all, yet close enough to pick up details." This could involve multiple camera setups or extensive editing.

The ultimate problem, however, is that "you're never really sure you're seeing an interpretation or what the choreographer originally set down. It's like learning music from a record."

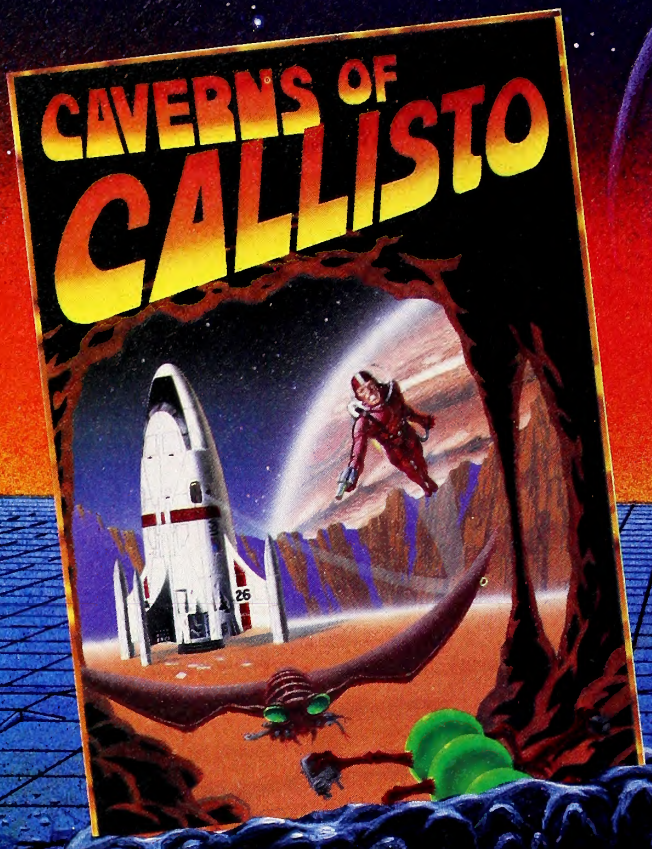
"Any good notation system will remedy that," Dombrower adds, although "paper can't convey enough dimension for the average person to easily understand a dance"—like a graphic system can, with its ability to evoke the actual feeling of performance.

Enter the Apple, dancing. ■

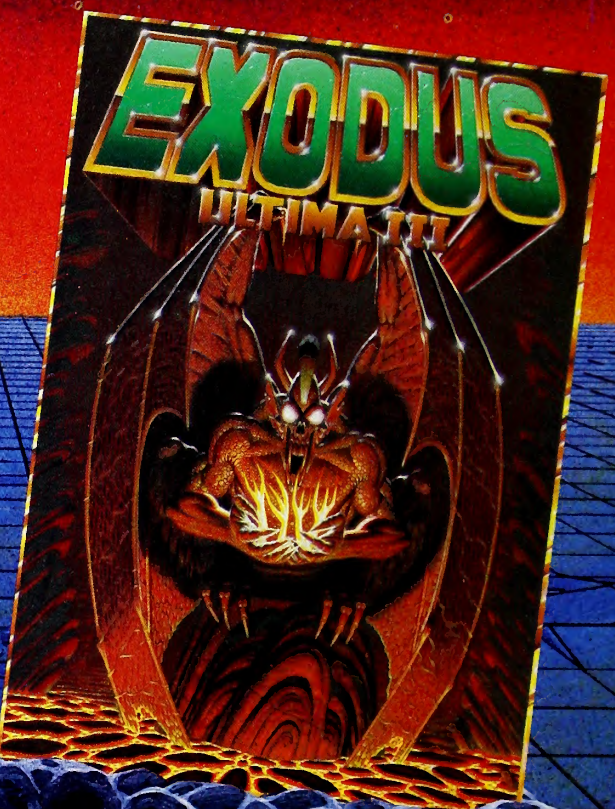
"Exodus: Ultima III, with a superior plot to match its superior gaming system, is a great game . . . it sets new standards for fantasy gaming state of the art."

Softline, November/December 1983

"Caverns of Callisto is a very challenging and enjoyable arcade game. I hope Origin Systems can continue to provide products of such quality." Core, December 1983



Created by Chuckles
$34.95
Apple and Atari.



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"Exodus: Ultima III . . . is fun and exciting to play and constantly intriguing." Softalk, November 1983

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Reviews

Unless otherwise noted, all products can be assumed to run on Apple II with 48K, ROM Applesoft, and one disk drive. The requirement for ROM Applesoft can be met by RAM Applesoft in a language card. Many Apple II programs will run on the Apple III in the emulator mode.

If the cryptic initials at the end of reviews don't fit staff (listed on page 4), then they refer to guest reviewers—this month, Michael A. Banks, Ken Goehner, Joel Harrod (Business Review Board), David B. Howlett, Trish McClelland, Paul Pagel, Ken Ryall, and Howard A Shore.

Flight Simulator II. By Bruce Artwick. No, this is not a sequel. It's not *The Bells of Saint Mary's*, *The Empire Strikes Back*, *Beneath the Planet of the Apes*, or *Porky's II*. This program is not just another James Bond movie.

Flight Simulator II is to the original *Flight Simulator* what *Apocalypse Now* is to *Sands of Iwo Jima*. One's a powerful cinematic experience; the other's just a good war movie.

Bruce Artwick's first *Flight Simulator* for the Apple appeared in the fall of 1979. In those days, the average Apple had a whopping 16K of RAM. Artwick thought it was neat having 3K more to improve on the 13K TRS-80 version of *Flight Simulator*. He even envisioned the day when he would have a lot more RAM to play around with.

On the average, software has improved considerably since the late seventies. Games are better. Word processors are better. Utilities are better. But *Flight Simulator II* is such a quantum leap forward in just about every way that it feels like you're using a different machine.

This program has so much depth that a single review can't do it justice. We're talking about the *War and Peace* of microcomputer programs.

Flight Simulator II puts you in a flying environment that is more than ten thousand by ten thousand miles square and encompasses the continental United States as well as parts of Canada, Mexico, and the Caribbean.

Flight Simulator II teaches you how to fly the Piper PA-28-181 Archer II—a single-engine, 148-mph, nonretractable gear airplane. You won't have earned a pilot's license by the time you've mastered the program, but you will know your way around a small airplane.

Since the program is about as hard to master as flying a real aircraft, there are two modes, easy and realistic. Though it would take hours, you could actually fly across the country in the easy mode. In the realistic mode, the plane would run out of gas. The realistic mode also takes into account varying weather, winds, and equipment reliability. Users can set their own conditions for each flight.

The instrument panel of the *Flight Simulator II* is modeled after the

real thing, and Artwick has improved the graphic representation of the instruments considerably over the original *Flight Simulator*. He has also included commonly used navigational aids—an omni-bearing indicator and for users with 64K, an automatic direction finder.

The graphics for the three-dimensional out-the-window display are also much improved. They feature full-color shading and solid objects on the landscape. The animation is quite realistic, making use of incremental fill techniques.

Flight Simulator II includes a World War I dogfight game, user modes that let you save specific conditions for a later flight, and an editor for changing the variables that control the aircraft's performance. The complete package includes an eighty-eight-page flight manual, four flight charts, a second manual called *Flight Physics and Aircraft Control with an Introduction to Aerobatics*, and one (count 'em, one) disk.

Of course, even *War and Peace* has its weak moments. In *Flight Simulator II*'s case, the WWI dogfight is not up to the standards of the rest of the program. Also, in easy mode it's possible to taxi on the ground all over the flying environment—even across Lake Michigan. Perhaps there are other minor inconsistencies, but they are few and far between.

Judging from the fact that the original, far more primitive *Flight Simulator* has been a consistent Bestseller for three and a half years, it's safe to say that *Flight Simulator II* will entrance and captivate a whole new generation of would-be pilots.

If they gave a Pulitzer Prize for software engineering, Artwick would win hands down. DH

Flight Simulator II, by Bruce Artwick, SubLogic (713 Edgebrook Drive, Champaign, IL 61820; 217-359-8482). $49.95.

The Writer. By Thomas Crosley and Burt Sloane/Softwest. *The Writer* is a simplified version of *PIE Writer*, low in cost and fairly powerful. In editing and formatting power, it outperforms most of the low-end word processors including *Bank Street Writer* and *HomeWord*. *The Writer*'s capabilities include telecommunications, mail merge, and 64- or 128-column display with a screen that alternates between sides to show both halves of what you've written (64 columns for 40-column displays, 128 columns for 80-column displays). Naturally, it also features word wrap, fast and easy cursor movement, global search and replace, and block manipulating capabilities.

However, *The Writer* doesn't quite compete with some of the slightly more expensive word processors, such as *Apple Writer IIe*. Block handling and search and replace are somewhat more limited than people who use a word processor for long documents would like. The basic functions are there, but it is not possible, for example, to make searches backward, or save a paragraph from text as a macro to insert where needed by pressing a few keys. Also, due to the size of the program, files are limited to about 15K in a 64K machine.

Business users and writers producing short manuscripts will find that *The Writer* meets most of their needs, however.

The Writer is self-configuring for the Apple II series. Configuration is carried out when the program is first loaded and requires the user to answer a few questions about the machine being used. This process erases several files from the disk, so the manufacturer recommends that the user make a backup copy of the program disk before configuring it.

The Writer includes a help screen and an interactive tutorial. These are nice supplements in many other word processors, but in *The Writer* they are vital, because of the confusing reference manual. Wading through the manual is a chore because it attempts to cover all configurations of the program. It's not impossible to use the manual, just time consuming.

The Writer supports most eighty-column cards, is menu-driven, and is a fair value for the price. MAB

The Writer, by Thomas Crosley and Burt Sloane/Softwest, Hayden Software (600 Suffolk Street, Lowell, MA 01853; 617-937-0200). $49.95.

Carrier Force. By Gary Grigsby. It is 1942 in the Pacific. Most of the American battleships are at the bottom of Pearl Harbor, the Japanese have swept over the central Pacific, and the only remaining force to oppose them is the U.S. aircraft carrier fleet.

In *Carrier Force* you command the most powerful, yet most vulnerable, thing in the ocean—a big flattop packed with fighters, dive-bombers, and torpedo planes. The game covers both the details of carrier aircraft operations and the strategic scope of the four major carrier battles of 1942: Coral Sea, Midway, Eastern Solomons, and Santa Cruz. It was these momentous battles, fought in the year after Pearl Harbor, that brought Japanese expansion to a halt.

Carrier Force is not a game of any one of these battles, but rather a gaming system applied to four different scenarios. The system takes each player through a highly structured sequence of operations. Each turn begins with a briefing and damage report, and then allows you to change the composition of each task force, launch aircraft, prepare aircraft for missions, land aircraft at a base, and move air missions around the map.

Air missions, usually consisting of single seaplanes, spend most of their time looking for the enemy. They move over a small on-screen area that shows ships, planes, and islands arranged on an invisible hexagonal grid. As each air mission moves along the scrolling display, the planes search for enemy ships or bases. Bomber missions have the option to attack any enemy they find.

The most frustrating and intriguing part of *Carrier Force* is locating the enemy. Since you have only limited knowledge of your opponent's whereabouts, each battle begins as a deadly game of hide-and-seek. Bad weather often hampers searching, and the search reports are usually inaccurate to some degree. Both sides have to stumble through this confusion before they can attack.

Attacks take place at the end of a turn amid sound effects and a running account of damage inflicted. Only craft in the same hexagon may attack each other.

The computer does the record keeping in *Carrier Force*, but this doesn't mean you can take it easy. Plan several turns in advance. Otherwise, you'll find that planes assigned to bomb an airfield are carrying torpedoes, carriers are unable to land aircraft because they launched too many during a turn, or bombers run out of fuel and have to ditch in the ocean. Even with careful planning, it is hard to win without the kind of luck real-life American admirals had at Midway when they destroyed the bulk of the Japanese carrier fleet with an inferior force.

Midway is the quickest and most exciting of the four scenarios. The island is approached by a huge Japanese invasion force that includes four heavy and two light carriers. The Americans have only three carriers and some pathetic aircraft. To make matters worse for the Americans, the Japanese aircraft are more accurate and have a longer range. And American torpedo planes are next to useless.

The Japanese have a similar advantage in all the battles except Coral Sea, but this is offset somewhat because the Japanese are given more to do. The disadvantaged side is also given handicap points to help even the score.

Because of its scope and complexity, *Carrier Force* can take several hours to play. The two-player version is great if you have someone you want to spend a lot of time with and have something to do while your opponent enters moves. Otherwise, if you play alone, the computer automatically assumes the Japanese role. A solitaire game can be started, saved, and restarted as a two-player game. This gives the curious the chance to check Japanese strength and positions (cheat) before restarting the solitaire game.

In either form, *Carrier Force* is an excellent strategy game that is very like its subject. Like a carrier battle, it is long, slow in developing, and occasionally tedious, but with periods of intense action. For those who like to plan for a decisive moment, it provides the same duties, fears, and frustrations of a real carrier admiral. KR

Carrier Force, by Gary Grigsby, Strategic Simulations (883 Stierlin Road, Building A-200, Mountain View, CA 94043; 415-964-1353). $59.95.

Flying Colors. By John Norby and Glenn Albinger. Wow. Neat. Thrills, fills, and excitement. Fun for the entire family. Look up on the screen! It's a bird or a plane or Marilyn Monroe! It's *Flying Colors*!

We had a small problem with this graphics package. Every time employees walked by and saw it on the monitor, they would ask to try it, and then could be separated from the controller only by threats of an extreme nature. It's to be expected, though. This is a mind-bogglingly easy-to-learn, easy-to-use hi-res toy.

Perhaps that's the wrong word. You could do business graphics with this system, but this is such an insanely happy program that it's hard to keep from smiling while you're merrily drawing away. And it's so simple that you could give one to your favorite two-year-old.

Just picture it: eleven brush-tips, sixteen diagonal and crosshatched color patterns, four solid colors, two blacks, two whites (a concession to Apple graphics hardware), circle and box functions, a smart fill mode that remembers the last color or pattern used, a point-to-point line func-

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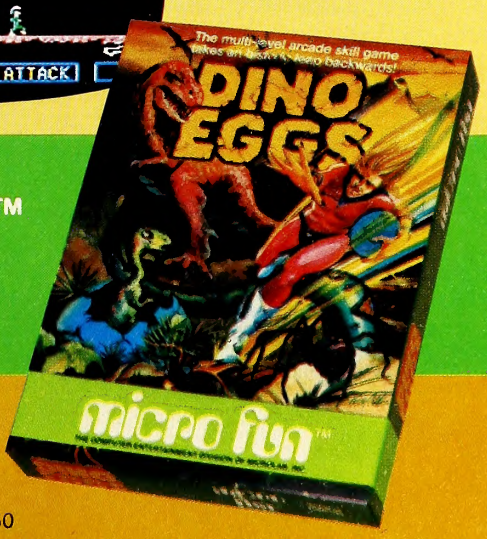

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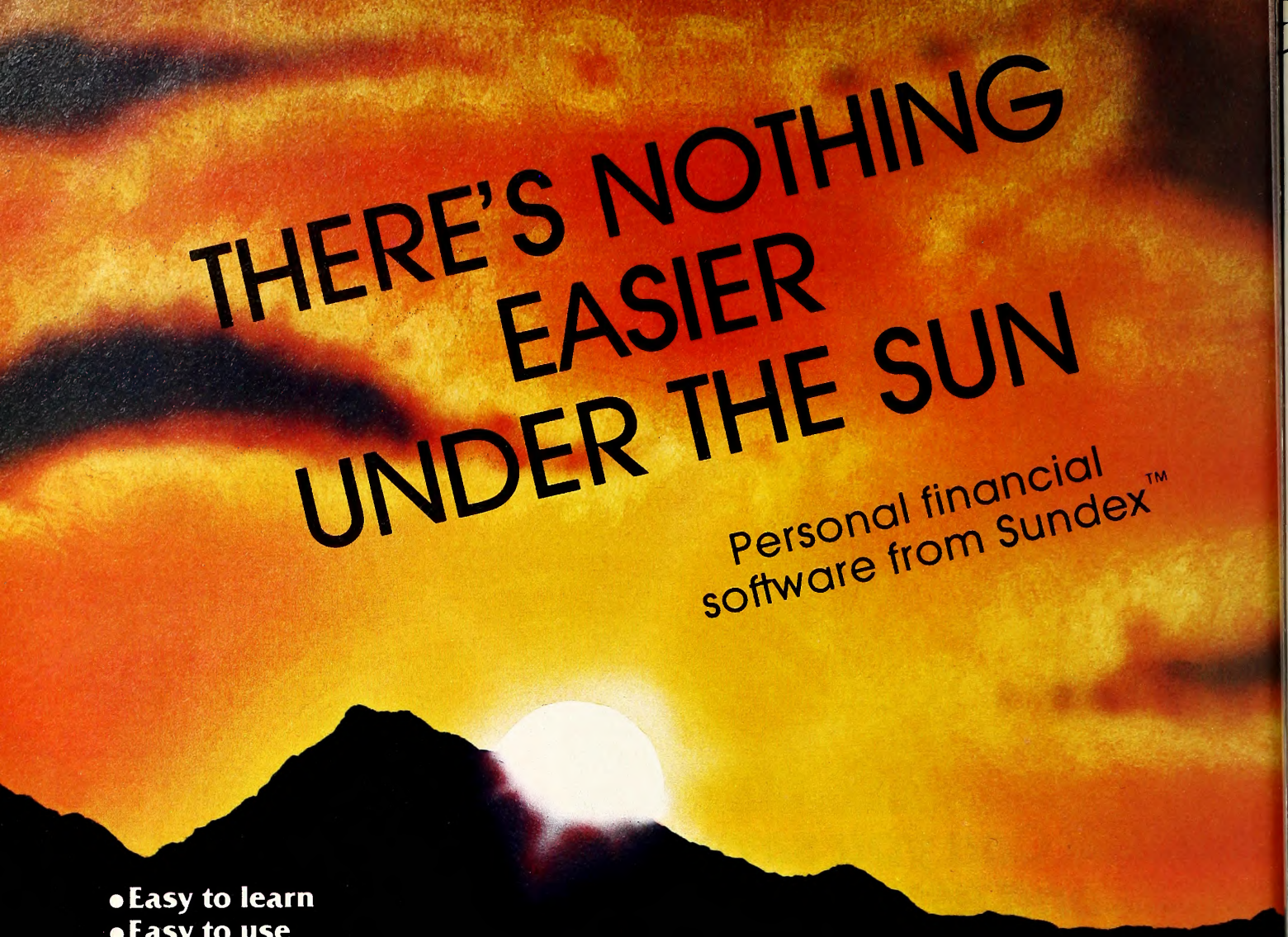

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tion, a freehand drawing mode, and a micro mode for doing detail work and delicate corrections, all controlled by a joystick, track ball, or other game controller.

You only have to touch the keyboard once after booting the disk and then you're off and running. Of course, if you really want to keep typing you can summon up the alpha mode to write on-screen and label anything you want, and when you want to save something it really helps if you give it a name, but otherwise you are totally free of the tyranny of the keyboard.

Don't forget to show off your masterpieces. *Flying Colors* features a really nice option called The Slide Projector that will display your creations in any sequence you choose at any time interval you choose between one and ninety-nine seconds. You can also set the intervals manually using the game controller. To arrange the slides in order and specify the time intervals, you do have to go to the keyboard, but the command structure is very simple, requiring mostly the arrow keys and the return key. The commands can be easily figured out in five or so minutes without the authors' very lucid documentation.

This program is tops and so is the company that produced it. They have an excellent attitude toward product development and service. Expect to see a lot of good stuff coming from them in the way of user-friendly graphics packages and peripherals very soon. KC

Flying Colors, by John Norby and Glenn Albinger, The Computer Colorworks (3030 Bridgeway, Sausalito, CA 94965; 415-331-3022). $39.95.

Word Processing. There are word processors, complete with hardware and specialized software, that are designed to automate an office by processing letters, manuscripts, and everything in between. These sophisticated systems cost a minimum of $4,500, and all they do is word processing, but they do it exquisitely. Then there are microcomputer word processing packages, designed to take the office computer and convert it into a vehicle for producing letters, drafts, and documents. In the past, there has been no comparison between the two systems.

It is obvious that State of the Art has attempted to bridge this gap with its new package that is entitled simply *Word Processing*. When traveling through the various menus and prompts, one cannot help but compare this program to the IBM Displaywriter, the Lanier, or the Wang word processors. It appears that a great deal of research was done into this type of equipment and accompanying software, because the best features of all three have been integrated into *Word Processing*. Most microcomputer word processing software does not even come close.

This program is not for beginners. It is sophisticated, comprehensive, and complex. Although the manual states that you don't need hands-on experience before using this program, a beginner would be lost before learning to create a document.

One reason for this is the installation procedure and the number of disks required. It would be easy to become intimidated by the various program disks and their certainly not-user-friendly names: WPA1, WPA2, WPB, WPC, and so on. And the mere fact that you are required to do a lot of disk-swapping to copy the program onto three blank disks before you can even use it is enough to make the average businessperson micro-shy. The copying process took an experienced user forty minutes. It's a good thing the installation procedure has to be performed only once, because once is more than enough. The manual is excellent, but it is not enough to rescue the user from a bad situation.

Once the system is ready to create a document, the going gets easier. *Word Processing* is completely menu-driven, and a help option is available. However, the software does tend to ask too many questions and to require too much answer verification from the user.

Word Processing has some especially useful features, though. The ability to enter passwords, for instance, gives the feeling of security. And the statistics provided on each document can come in handy, such as the date of creation and date of last revision. The program allows the linking of files, a feature too seldom found in other word processors.

Of course, this program provides all the capabilities that have come to be expected from word processing packages, such as the ability to move text, delete, add, or modify words, sentences, or whole paragraphs. A wide variety of print options are available through the use of simple, easy-to-remember commands such as pressing the underline key before and after a word or group of words to indicate underlining.

One of *Word Processing*'s most valuable features is its ability to interact with the State of the Art accounting packages. This helps the users of those packages to integrate data from the accounting modules into reports created on the word processor.

Word Processing is best used with large documents, complex files, or interactive data. It's overqualified—and too complicated—for short letters, infrequent essays, or small files. *Word Processing* belongs in progressive office environments where its users are familiar with sophisticated word processing concepts.

While using this package, pray that no problems develop. The manual specifically states that if a problem occurs that isn't addressed in the manual, the user should seek assistance from the dealer. State of the Art says they completely support their dealers, and that seems fine, but what if you've moved and your dealer has never heard of the program?

Word Processing doesn't quite succeed in bridging the gap between microcomputer word processing software and dedicated word processors, but it's a good try. If the number of disks were reduced, the superfluous questions eliminated, and the technical support made more accessible, this program would be well on its way. TM

Word Processing, State of the Art (3183-A Airway Avenue, Costa Mesa, CA 92626; 714-850-0111). $395.

Defender and **Stargate.** In the game room the other day, a new member of the review staff watched as someone played *Defender*.

"Oh no," the new kid moaned. "A rip-off of *Repton*!"

Everyone in the room turned and stared at the young fellow with glares of disbelief, not sure whether the remark was made facetiously or in earnest. It was made in earnest.

That the newcomer didn't recognize the granddaddy of the fly-over-the-terrain genre whence *Repton* came says much of his limited arcade experience. It also says a lot about Atari's timing in releasing *Defender*, *Stargate*, and a slew of other oldy moldies. Better late than never?

The original coin-op versions of *Defender* and *Stargate* have been around for several years but have now been generally abandoned by arcade fans for newer games on the block. When gamers tired of *Galaxian* and *Missile Command*, *Defender* set down a blueprint for an entirely new kind of game. Instead of sitting at the bottom and shooting toward the heavens, *Defender* put the player in the seat of a spacecraft that could fly forward, backward, up, and down.

Saving humanity is the theme of the game. Aliens hover over the ground, picking up hapless humans who don't know enough to hide behind a bush or under a rock. The player's job is to "zap the enemy and rescue humans." Forget it. The real object of the game is to shoot the weird-looking objects and try not to get hit.

There's not too much separating *Defender* and *Stargate* in terms of game design; the big difference is in execution of each. Flying the ship in *Defender* feels like driving a car that's limited to first gear. The cartridge version for the Atari computer offers firmer control of the ship; why couldn't the same care have been taken in programming the Apple version? (There's a better public-domain version of the game available, so much like the original that the programmer wouldn't release it for fear of a lawsuit.)

Compared to *Defender*, *Stargate* is a crisper, smoother, faster version of the same game idea. Playing *Stargate* after several rounds of its predecessor is like racing around in a Corvette after putt-putting around in a midsixties vintage Pontiac —an arcade rush.

Stargate's radar scanner isn't as effective as *Defender*'s; in *Stargate*, it's difficult to see which blip represents the player's ship among a sea of alien blips (aliens are one pixel; the player's ship is two). Never mind the scanner, though. The time spent trying to figure out who's who is better spent trying to blast the pesky critters out of the galaxy.

Sirius's *Gorgon* was the first Apple version of the *Defender* family. Then came *Eliminator*, *Rear Guard*, and *Repton*. Memories of days long gone.

The *Defender* era has passed, and anyone other than Atari would be foolish to think they could publish another look-alike and get away with it. Atari will probably get away with it for the same reason Sierra On-Line got away with *Frogger* and Datasoft got away with *Zaxxon*—this is the official *Defender*.

Even though *Stargate* possesses many of *Defender*'s (and *Gorgon*'s, and *Rear Guard*'s, and *Repton*'s . . .) characteristics, it's executed so well that it deserves to stand on its own merits.

Stargate is the souped-up version but *Defender* is the classic original. MTY

Defender and *Stargate*, Atarisoft (1265 Borregas Avenue, Sunnyvale, CA 94086; 408-745-2000). $34.95.

Stickybear Opposites. By Richard Hefter and Janie and Steve Worthington.

> *. . . no one knows what is good*
> *Who knows not what is evil;*
> *And no one knows what is true*
> *Who knows not what is false.*
>
> —"Seth Compton," from *Spoon River Anthology*, by Edgar Lee Masters.

This program's authors steer clear of the philosophical realm discussed by the poet, but they have presented a fine educational tool to teach the concept of everyday opposites. In/out, many/few, day/night, empty/full, and others appear here in the crisp, attractive style that has come to be associated with this software house.

The pictures are finely drawn and gaily animated using the trademark Stickybear character and other objects a child would find pleasing, such as seesaws, climbing vines, and little airplanes.

When you boot the program, a picture and word appear that represent one half of a pair of opposites. Pressing a key brings you the other half—for instance, a speeding auto instead of one just idling along. Different musical notes accompany each half of the opposite. As a nice change of pace, a couple of pairs are silent.

Some pairs the authors have deemed particularly important are presented in more than one way. The authors say they did this to prevent kids from associating an idea with only a single set of pictures. This is wonderful, but the program would have benefited if the concept had been applied to all of the pairs instead of just a few. In any case, the examples the authors did choose are both appealing to watch and clearly illustrative of the opposites they teach.

Unfortunately, the sound can't be eliminated, although it is generally an asset. And you can't select a particular pair of opposites that you want your child to practice. You just have to wait until the desired pair comes around again.

This program fits preschoolers well but would probably be inappropriate for those outside the recommended age group of three to six. On the other hand, even adults have been known to sit transfixed before the screen when Stickybear and company go into action.

Stickybear Opposites includes a hard cover book, a large poster reinforcing the concepts, and a sheet of stickers featuring the dapper bear. *Opposites* won't teach kids to make moral judgments, but it will help them learn which way is up and other physical distinctions. IP

Stickybear Opposites, by Richard Hefter and Janie and Steve Worthington, Weekly Reader Family Software (245 Long Hill Road, Middletown, CT 06457; 203-347-7251). $39.95.

WordWorx. By Susan Christie and Paul G. Weisberg. *Fauktourea.* Is it (a) the sound made by a sumo wrestler choking on some bad sushi, (b) the mating cry of libidinous Hindus, or (c) a common English word? The answer: (c) a common English word. Well, sort of. Actually, it's one of 150 "mystery words" contained in Myspellery, by far the better half of this two-game word puzzler from Reston Publishing.

Intentionally or not, Myspellery underscores the idiocy that is the King's English by flashing a series of letters on the screen and giving the player phonetic clues to help solve the puzzle. The object is to identify a common English word by pronouncing the various vowels, consonants, vowel/consonant blends, and diphthongs contained in each puzzle. The same vowels, consonants, and so forth can and often do take varying pronunciations each time around, and there, mad gamester, is the rub. You come out of the game pitying the poor soul faced with the pesky task of learning English as a second language. Hell, you've yet to master it as your first.

Correctly guessing a word results in a maximum of 100 points; each clue requested reduces the total by 10. A maximum of nine clues is given for each puzzle, each set of clues containing the number of syllables in the word as well as the phonic breaks. For example, the clues for the mystery word *Fauktourea* are broken down thus: "3 syllables"; "F AU K T OUR EA"; "F as in enforce"; "AU as in laugh"; "K as in blank"; "T as in teamwork"; "OUR as in yourself"; and "EA as in beneath." The word, if you haven't guessed by now, is *factory*.

The game is alternately ego-massaging and challenging, and that, oddly enough, is one of its minor flaws. The degree of difficulty built into the game is inconsistent with the designers' intentions. Myspellery has two levels of play, the second supposedly more difficult than the first; yet each contains virtually an equal number of easy and challenging puzzles. Another drawback is the user input system enabling players to add puzzles of their own in a third file. It's pointless. Players inputting their own puzzles will doubtless remember their entries in subsequent games and steamroll their opponents into submission. If you went to the "I'm OK/You're OK for a moron" school of gamesmanship, this might have some appeal.

On the flip side of *WordWorx* is Sentence Maker, a game centering on groups of five initials, each letter standing for a word in a commonly used expression, motto, or famous quotation. One hundred fifty entries make up the database, the sentences drawn from literature, history, popular songs, TV commercials, and so on. To solve a phrase, players take turns composing five-word sentences, beginning each word with the corresponding letter in the string. When one of the words contained in the mystery phrase is used in one of the players' sentences, that word replaces the corresponding initial in the string. No word can be duplicated in any of the sentences, and once a mystery word is uncovered it of course must be used in all subsequent entries. In addition, the opposing player must approve each entry; this can result in endless debate and is part of the fun (is "souped-up" a single word including a hyphen, or two words joined by the hyphen—grammar freaks know, but how many players do?). A difficult string can take hours to solve, but the object of the game is not so much to solve the phrase as it is to compose as many creative sentences as possible. If both players become bored with an unsolved string, they can move on to the next.

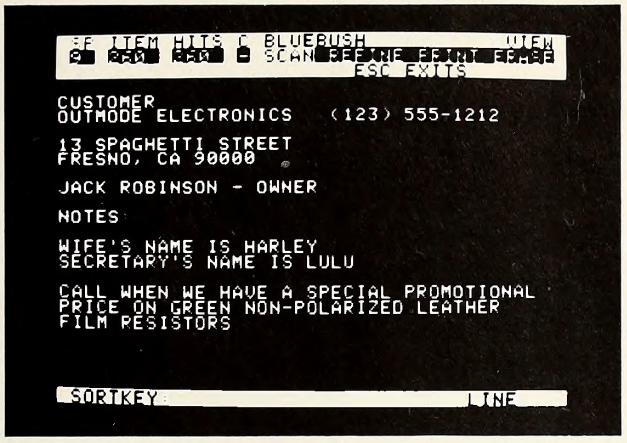
As with Myspellery, there are two levels of play, the second level including the historical or literary source of each entry. There's also a file for user input (again, pointless).

Overall, though, both games are great fun, with enough entries of varying difficulty to challenge eighth-graders, graduate students, large-breasted starlets, everyone. Who said life wasn't *ghor*? CC

WordWorx, by Susan Christie and Paul G. Weisberg, Reston Publishing (11480 Sunset Hills Road, Reston, VA 22090; 703-437-8900). $34.95.

Apple II-6502 Assembly Language Tutor. By Richard Haskell. Years ago, all conversations with computers were carried out in machine or assembly language. Today, most computer users learn

How to find Jack Robinson quicker than you can say it.



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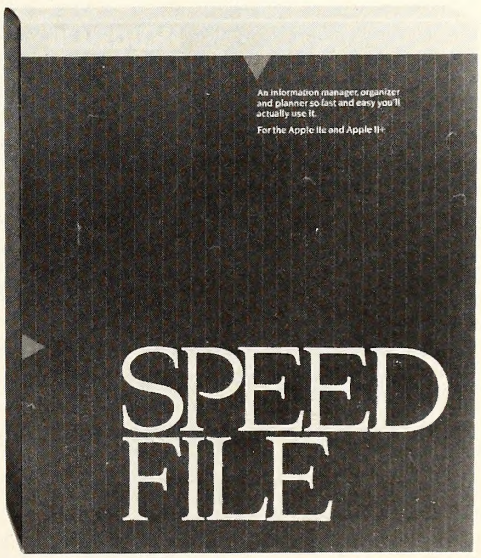

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interpreted languages such as Basic; knowledge of assembly language is no longer imperative. Its study is left primarily to professional programmers or those with an adventurous spirit. These adventurers have a kinship with the computer pioneers and a desire to see how things operate at a ground level. They're willing to spend more time developing a program to increase its speed and efficiency. If you're interested in learning assembly language programming on the Apple, and you have a working knowledge of Basic, Haskell's *Tutor* is a superb teacher.

Learning assembly language with this package is a doing-and-seeing procedure. The disk contains a machine language Monitor program called *Tutor*. With *Tutor* in action, you have a simultaneous display of the register contents of the 6502, eighty-eight selected bytes of memory, and a command line. A disassembly of the next command to be executed is also shown.

The accompanying book is an integral part of the tutorial. It opens by covering the reasons for using assembly language—it's fast, you'll get to form a more intimate relationship with your microprocessor, and you'll have a better understanding of how the computer works. Haskell forgot to add that it's fun! Chapter 1 also introduces you to the *Tutor* Monitor program, which turns out to be the glue that holds everything together and the fuel that makes it run.

Chapter 2 focuses on the 6502 microprocessor: what it is, what it does, and what it means to program it. Then you slide into using binary and hexadecimal arithmetic and hex-to-decimal/decimal-to-hex conversions.

The next several chapters deal with very low-level programming details: the 6502 memory and registers, and how to gain access to them and use them. You're also drilled on applications of the 6502 instructions used to program in machine language. You'll probably never memorize them all, and there's no need to do so; they're all laid out in an appendix.

Some time is spent on 6502 arithmetic. Here you'll discover the use of positive and negative numbers and how the 6502 deals with them. While you may not need to deal with negative numbers during your initial assembly language programming attempts, sooner or later you will. Indeed, some assembly language instructors don't even mention the use of negative numbers to their beginning students; often that subject is dealt with only in advanced classes.

The *Tutor* program is a sophisticated Monitor with a number of commands. The arrow keys can be used to move a pointer through displayed memory. You can set breakpoints, manipulate registers or blocks of memory, execute programs, disassemble portions of memory, calculate branching offsets, print disassembly listings, save or load binary files, or quit to the Apple Monitor or to DOS. The *Tutor* provides several automatic tools to help you write machine language by hand—that is, without an assembler. This may seem like a contradiction, but it's an effective way to learn.

Succeeding chapters teach you more about the Apple itself and how to work with it at the machine-language level. This information covers the method used to display characters on-screen, how to use both lo-res and hi-res graphics, and details of the game I/O port and the peripheral I/O slots.

You're even exposed to developing your own hardware. Information on the use of the 6821 PIA (peripheral interface adapter) and 6850 ACIA (asynchronous communications interface adapter) entice you to warm up your soldering iron to build a printer interface and a real-time clock.

The appendixes contain tables listing the 6502 operating codes, a summary of the *Tutor* Monitor program commands, information on how to use machine-language routines from Basic programs, and some data sheets for the integrated circuits used in the hardware section of the text.

This program merits an A for performance. Haskell has done a good job of presenting a wealth of information to would-be assembly language programmers. This is a welcome contrast to the authors of some 6502 assembly language books who find certain material difficult to handle and therefore ignore it. Haskell's book and disk are different—they're worth the price. This book-disk combination is good not only for individual study but also as a teaching tool for user groups, classrooms, or wherever adventurous spirits congregate. PP

AppleII-6502 Assembly Language Tutor, by Richard Haskell, Prentice-Hall (Englewood Cliffs, NJ 06732; 201-592-2347). $34.95.

The Learning Line. By the Boxes. While little software can hold the attention of a toddler, *The Learning Line* seems to be an exception. This may well be the first program a child can learn to use and understand.

Aimed at children aged four to seven, *The Learning Line* helps kids understand the fundamental relationships between letters, words, numbers, and pictures. Only a joystick and the escape key are required to guide an animated monkey under a clothesline, where the main menu options—clothes, words, faces, letters, numbers, and objects—are displayed as pictures hanging on the line. You select an option by using the joystick to move the monkey under the desired item.

The games are all played in the same way. After you select the clothes option, for example, you are shown wearing apparel hanging on another clothesline. One left sock appears centered above the others and you must find another left sock hanging on the clothesline. To indicate that you have found the mate, you must move the monkey under the matching item and press the fire button. If the choice is correct, the item gets tossed into a laundry basket and stomped by the monkey while music plays. "S" toggles the sound.

If the answer is incorrect, however, there is no negative reinforcement. No buzzers buzz and the monkey doesn't frown or shake his arms at you, he simply tries again. This is one of *The Learning Line*'s nicest features.

In the Words section, the object is to match a picture with its name spelled out under it with the same word hanging on the line. Later, the player matches the name with the picture, thus gradually learning to recognize that the word represents the picture. If the player's choice is correct, the monkey sweeps the word into a bucket. In Objects, the player must match complementary items such as a hammer and saw; and Faces, Letters, and Numbers are straightforward matching games, each featuring the same delightful animated monkey. Pressing the escape button will return the player to the main menu at any time.

The Learning Line is definitely for the very young, but if you're looking for lessons that will capture and hold a child's attention, this program isn't a bad purchase. HAS

The Learning Line, by the Boxes, Eric Software Publishing (1713 Tulare, Fresno, CA 93721; 209-237-0989). $39.95.

Taxes-Taxes. This is an inexpensive and easy-to-use aid in calculating personal income taxes for the middle-income taxpayer who itemizes deductions. The stress is on deductions because this program is designed to assist with the federal form 1040, not the 1040A or 1040EZ. The stress is also middle income; high-bracket taxpayers with tax shelters and minimum tax concerns will probably need to consult a CPA anyway.

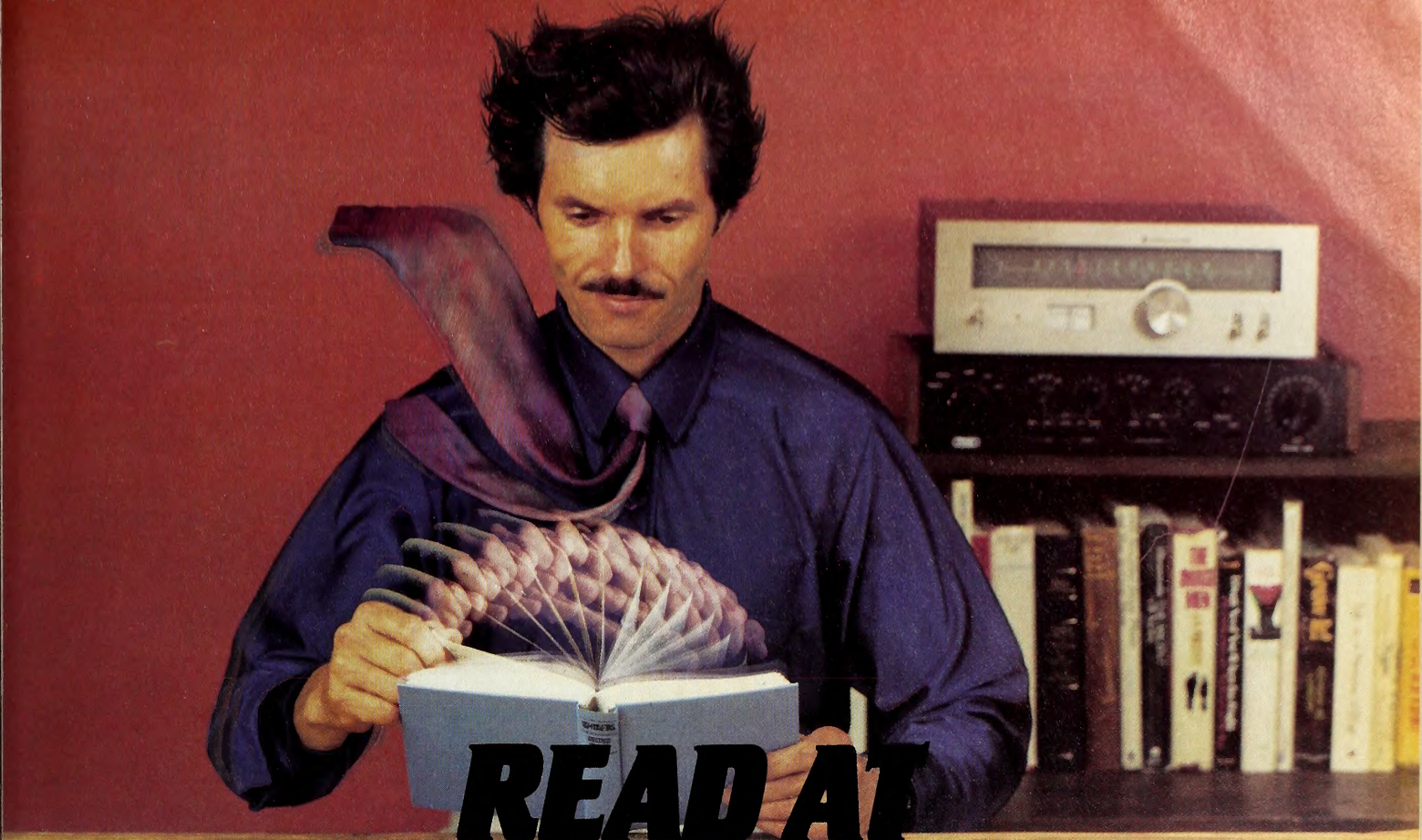
For the middle income earner who itemizes deductions, this program can be a real timesaver and will help ensure the accuracy of your return. Users will have to know the basics of deductions and credits to use this program effectively, however.

Taxes-Taxes calculates the line-by-line amounts for the following IRS schedules, Form 1040 (long form), Schedule A (Itemized Deductions), Schedule D (Capital Gains and Losses), Schedule G (Income Averaging), Schedule SE (Self-Employment Tax), and Schedule W (Working Couple Deduction).

Inputting information into *Taxes-Taxes* is simple and straightforward. The eight screens used for inputting are arranged in order so that you progress through income to deductions and on to more serious business, such as income averaging. There are two weaknesses regarding input. First, it would sometimes be helpful to have more input lines. For example, in the deductions section, there is a line for home mortgage paid to financial institutions or individuals, a line for credit card interest, and a line for other interest. Here, all loan interest, car loans, and educational loans have to be added separately and then entered in total. It would be very helpful to be able to enter these loan amounts separately. This would be good documentation later, and would provide a better guide for preparing tax returns in subsequent years.

Second, some other items, including the child care credit, have to be calculated manually before being entered into the input screen. This is unfortunate, since it would have been relatively simple to let the computer calculate child care credit based on the taxpayers' salaries and the number of children in child care facilities.

One helpful feature is the Input Item Reference Summary, which appears at the back of the documentation. Not only does this provide the name of the input line, but it also provides you with a short explanation



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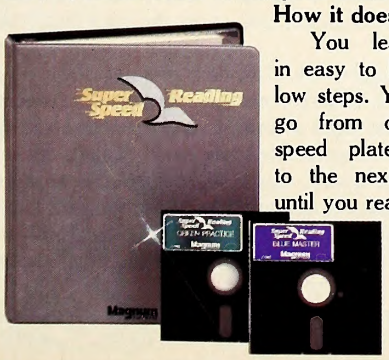

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of what goes on the line. This is especially helpful in the instances in which you do have to do calculations before entering an amount.

One of the program's most helpful features is that it can calculate your tax liability based on income averaging. If you have never wrestled with this calculation, you may not appreciate the worth of this feature that takes the arduousness and possibility for error out of a complex six-step process.

Taxes-Taxes is also designed to handle capital gains and losses. The user only has to enter net short-term capital gains/losses and net long-term capital gains/losses and then *Taxes-Taxes* calculates the rest.

It should be noted that only the net short-term and long-term gains and losses can be entered. When it comes to completing your tax return, you will have to list each short- and long-term transaction individually. Although this is not a big imposition, it would be nice if you could enter and retrieve the detailed information on each short-term and long-term capital gains transaction.

For $35, this program is an easy-to-use tax preparation and planning aid that is well worth the money. Including the time required to input the information, with *Taxes-Taxes* a 1040 with income averaging, took eight minutes to complete. Manually, this same set of taxes took well over an hour. JW

Taxes-Taxes, Taxco Systems (58 Parade Hill Road, New Canaan, CT 06840; 203-966-8761). $35.

Computer Training Tapes. By Jo Ann Robinson. If Apple included these tapes with each computer sold, they would be guaranteed fewer questions, problem calls, and irate users. More importantly, the computer user would receive answers to questions without the usual runaround or frantic long-distance calls.

Written for the computer novice, *Computer Training Tapes* offers information, tips, and techniques that can benefit even a seasoned Apple user. The package consists of three cassettes and one disk. The method of training is simple: You listen to the tapes and practice what you learn on the computer. This is accomplished by using the disks that normally accompany the IIe: The DOS 3.3 Sample Programs and System Master.

Computer Training Tapes's instructor, Doug Eide, follows his own instructions as he speaks, and the listener can actually hear his computer in the background. The instructions are so easy that a schoolchild could follow them. In the event of a user mistake, Eide explains exactly what to do. Not only that, but he delivers his explanation so smoothly that you don't get sidetracked while waiting for the next instruction.

The tapes are labeled Beginner, Intermediate, and Advanced. It is assumed that the listener knows very little about the IIe. The tapes begin at square one, with a definition of hardware. As you progress, topics expand to include sample programs, calculations, and even programming. Everything is thoroughly explained, from the keyboard and special function keys to the disk operating system. Eide spells out the commands as though he is talking to himself while typing, which adeptly disguises the fact that it's probably done to assist people who are bad spellers or who might misunderstand the command. He manages to explain tasks without making the user feel inferior or slow. He never makes listeners feel as though he's looking down at them; he simply guides them.

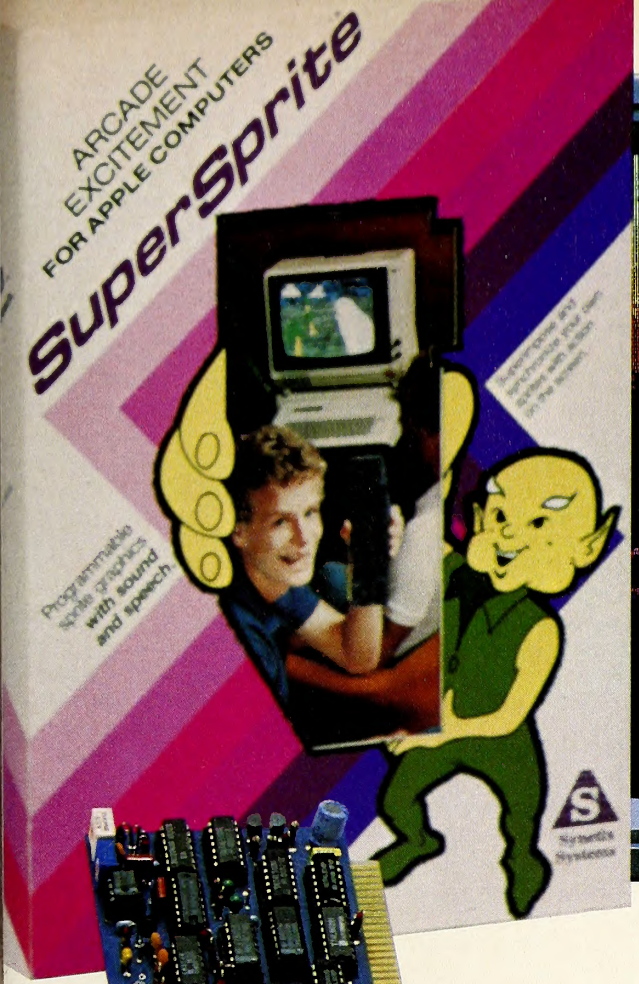
These tapes have some advantages that classroom courses don't, because you can learn at your own pace. One side of a tape generally takes about forty to fifty minutes to complete, but you can turn it off whenever you want. Quizzes on different lessons are available on-disk. The questions are multiple choice, and if you enter a wrong answer you are immediately given the correct answer and allowed to proceed.

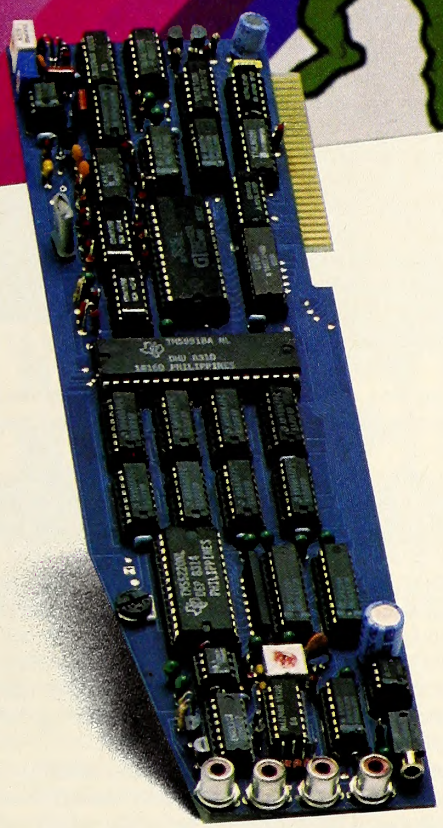
Jo Ann Robinson, the author of the tapes, should be commended. The lessons flow smoothly and logically and carry the user easily through each task.

There is one disadvantage to the *Computer Training Tapes*—the lack of a table of contents. This is sorely needed, because the listener must search randomly through the tapes in order to find the answers to specific questions. With a table of contents, the tapes could be used not only for the initial training of IIe users, but also as a continual source of reference. However, the tapes do accomplish exactly what they set out to do: train the novice to use an Apple IIe. The tapes are highly recommended for anyone who owns an Apple IIe, regardless of computer expertise. TM

Computer Training Tapes, by Jo Ann Robinson, Personal Tutor Associates (Box 246, Clinton, MD 20735; 301-856-2280). $49.95.

Picture Writer. By George Brackett. This program has some wonderful





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features, but considering that it is aimed at kids five through fifteen, it is awkward and cumbersome to use. The command sequences are confusing; the fill routines, and especially the edit mode, require too many tricky joystick and keyboard maneuvers.

Yet, in all fairness, there are some nifty things about *Picture Writer*. The cursor has an interesting configuration—it works in two parts. When you wiggle the joystick, the center portion of the cursor goes ambling off wherever you choose, while the rest stays put. This allows you to have precise line control because you draw straight lines between the two parts of the cursor. This feature also controls the rectangle and oval drawing functions, which is kind of exciting because it allows you to squeeze circles horizontally and vertically, a feature generally not seen in less sophisticated graphics packages. You can create perspective with the ovals, and you can clone shapes by pressing the repeat key. This is a little hard to control, but Mondrian would have loved it.

In addition, a function called "pin" allows you to nail the cursor to one spot and draw lines radiating from it. Then there's "backup," which will erase the last step drawn, and the edit mode, which will allow you to erase any step in the picture. Unfortunately, this invaluable function is the hardest to use. Along with the program's unusual good points, there is an unusual negative one. You can draw lines of only one width. This means that in order to produce a wide line, you have to draw the line's perimeter and fill it in. This is definitely not an aid to precision graphics.

Also notable is the option to have a musical accompaniment while drawing. Kids may enjoy this, but for others, the best thing about this particular aspect is that you can turn it off. If it couldn't be toggled off, parents would be begging Scarborough to include earmuffs and cotton balls with their software.

Other than these features, this is a pretty standard graphics program. It has twenty-one colors. They actually consist of eight colors, including two whites and a black, and thirteen fill-routine shadings created by mixing two colors in a horizontal pinstripe pattern.

All in all, *Picture Writer* is an unusually capable program. Yet, considering how extremely difficult it is to use, it would probably have been better aimed at adults. KG

Picture Writer, by George Brackett, Scarborough Systems (25 North Broadway, Tarrytown, NY 10591; 914-332-4545). $39.95. Requires 64K.

The Oddsmaker. By John Zieg. Ever since the movie *The Sting*, Americans have hungered for the chance to make their living rooms pari-mutuel betting parlors. Have your friends over for a night of friendly wagers; will Frank Furillo and Joyce Davenport adopt? Will there be a major earthquake in California in May? Which city will be nearest the epicenter? Will it rain before morning? How many inches?

Pari-mutuel betting is a system whereby a pool is created for an event's every possible outcome, as determined by the house. For instance, "Furillo and Davenport adopt a boy before the next season begins" could be one pool; "Furillo and Davenport adopt a girl before the next season begins" could be a second pool; "Furillo and Davenport adopt twins" could be a third; "Furillo and Davenport choose not to adopt before the next season begins" could be a fourth; "Furillo and Davenport attempt to adopt but are turned down as unacceptable parents,"a fifth; "Davenport sues for divorce, Furillo adopts twins" (the long shot)—whatever the house can imagine as an outcome and someone will bet on. After the event is over, the pools are combined, the house takes its cut, and the people who contributed to the winning pool divide up the remaining pot—their winners' shares having been determined by the amount they each put in the winning pool.

The Oddsmaker provides for fourteen possible pools, allowing anything from "Furillo adopts Faye's new daughter" to "Furillo adopts a new attitude toward the Chief" (the more sophisticated houses avoid such subjective bets). Once the house has determined the betting categories and its percentage of the total pot, bets are collected. *The Oddsmaker* shows the fourteen pools by title. The menu allows the house to either take bets and show the odds (as calculated by the amount of money per pool in relation to total bets), take bets and show the payoff, take bets and show the amount in the pool, or take bets and show an announcement. The announcement can be any message the house cares to display while taking bets, such as, "Lemonade available in lobby." Bets are taken by typing in the bettor's name, the number of the pool he or she wants to bet on, and the amount of the bet. A prompt will ask for bet verification, and, if verified, the bet is taken and the screen updated.

One of the nicer features of *The Oddsmaker* is that it will print tickets. After selecting the print option from the menu, the house takes bets as usual; after each bet is taken, the printer will print two tickets—one for the bettor and one for the house—showing the name of the bettor, the pool number, and the amount that was bet. The program will also print a two-line message on the tickets so that you can keep your payoffs straight.

The Oddsmaker will also save the information for more than one betting event. So if you have a doubleheader to cover, *The Oddsmaker* can accommodate you.

The program's only glaring fault is that it does not calculate the amount to be paid to each winner. Taking a major California earthquake, for example—imagine that pool number two ("Bakersfield is nearest the epicenter") in a fourteen-pool event was the winner, the total pot was $1,000, and the house cut was 15 percent. The house would draw its $150 first and the remaining $850 would be divided among all those who bet on Bakersfield, pool number two, to win (lose?). If pool number two contained $200 and you had bet $20, or 10 percent, you would receive 10 percent of the pot, or $85.

This is simple enough to do on paper (even without round numbers), which is good, because you will be doing some figuring. *The Oddsmaker* displays the total pot, the amount in each pool, the house cut, and the amount in the total pot after the house cut, but it does not calculate the amount to be paid to each winner. You, as the house, have to figure that out yourself. And while that is easy to do, it is far easier to do with a computer. Because each bettor's name, the pool he or she is betting on, and the amount bet are all entered into the computer, there is no good reason for *The Oddsmaker* not to compute each winner's take. It's ludicrous. Computers, after all, are for computing; it's what they do best.

So, if someone in your office is having a baby and everyone wants to predict the baby's weight, or the boys in your lodge want to bet some money on the Summer Games, *The Oddsmaker* can cover your bets —almost. TZ

The Oddsmaker, by CZ Software (358 Forest Road, South Yarmouth, MA 02664; 617-771-4155). $44.95.

The Sweet Shoppe. By the Boxes, Daus, and Murrays. Right about the time that computers became affordable for personal use, people made a discovery. Kids like computers! Most adults are afraid to make a mistake, but kids have the foresight to remain unintimidated by these machines.

Something else happened at about the same time: video games. And ever since, parents have wanted to channel this interest into something educational.

The Sweet Shoppe is a collection of three games for children aged four to seven. Simple in approach, it's main thrust is attractive graphics and a purely positive approach to learning. It requires few instructions. A four-year-old could probably learn to run the whole show after a few hands-on lessons from Mom or Dad.

The Sweet Shoppe is completely joystick-controlled. There are no buttons to push and no keys to learn, except the escape key to quit.

A character called Mr. Jellybean appears inside the sweet shop upon boot-up, waiting to be guided to one of the three counters that represent different games. All three are simple math exercises: counting, subtraction, and addition of numbers one through ten.

Each game consists of graphically displayed math problems. In the first game, a jellybean jar tips over and one to ten jellybeans roll out to be counted. One of the numbered balloons at the top of the screen contains the answer. The player indicates a choice by steering Mr. Jellybean to one of them. If the choice is incorrect, Mr. Jellybean drops back to the bottom but never stops smiling. If your choice is correct, the graphics and sound explode in celebration. Then it's on to the next problem. Pressing escape returns you to the menu. The ice cream and popcorn games are similar, with numeric addition or subtraction problems written on ice cream stands or tubs of popcorn.

The Sweet Shoppe is mainly a repetitive math drill with a simple plot, yet it is fun too. The program appears to be well thought out, and the big, colorful shapes are mouthwatering. Yet, perhaps *The Sweet Shoppe*'s best feature is its unlimited warranty. The authors say, "Even a disk clogged with peanut butter and jelly will be cheerfully replaced." Your disk drive might not be so lucky. DBH

The Sweet Shoppe, by the Boxes, Daus, and Murrays, Eric Software (1713 Tulare, Fresno, CA 93721; 209-237-0989). $39.95.

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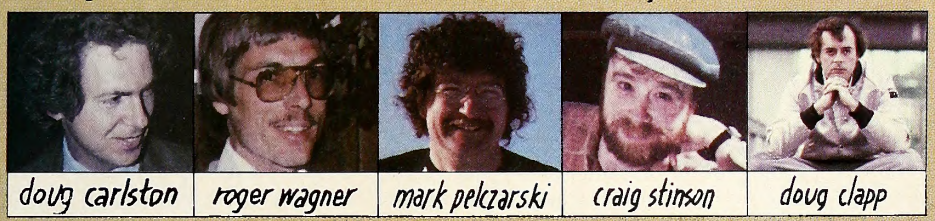
Our authors have earned the right to be considered experts in their chosen field. Each one of them works in the industry and works hard at developing new standards in computer products. These are authors proven to be effective through their monthly columns and tutorials that elicit positive response from readers throughout the world.



Doug Carlston has already taught thousands of people the essence of Applesoft through his *Softalk* columns. He founded Broderbund Software, one of the most successful software companies around—known for quality products. As president, he is constantly aware of the trends and possibilities.

Roger Wagner also began a software company, Southwestern Data Systems. He has produced the popular Merlin assembler, which has gained widespread use and recognition as a great product. Who better to learn assembly language from?

And as far as graphics are concerned, why not turn to the man who has brought us the *Graphics Magician* and *The Complete Graphics Package*—two incredible graphics tools used by software developers and home programmers alike.

Mark Pelczarski, president and founder of Penguin Graphics, is the man who knows graphics inside and out.

If it's the PC you favor, Craig Stinson will explain it all to you. As editor of *Softalk for the IBM PC*, he has the kind of knowledge very few can duplicate. He knows the strengths and limitations of the machine, and keeps up with all the latest developments. Author, editor, scholar. What more could you want?

When Doug Clapp first came to us with the idea for a book on Apple's newest computer, we were immediately taken by his incisive wit and phenomenal knowledge base. While spending more than six months behind the scenes at the Macintosh group, Mr. Clapp amassed an incredible amount of fascinating information about the machine: history, design, operation, software, hardware, and potential. His writing style is unique in computerdom: an enthusiastic, highly readable expression of the wonder and excitement that is Macintosh. There will be countless books about Mac—there is only one by the irrepressible Doug Clapp.

Softalk's Reading List.

Applesoft Isn't Hard:
Basic Programming for the Apple II
By Doug Carlston
A comprehensive tutorial on Applesoft, including over thirty program listings.
232 pages ISBN 0-88701-002-4
$19.95 book/$9.95 disk/$27.95 book and disk

Assembly Lines: The Book
By Roger Wagner
An introduction to 6502 assembly language programming for the novice.
272 pages ISBN 0-88701-000-8
$19.95

Graphically Speaking:
Portrait of the Artist as a Young Apple
By Mark Pelczarski
An in-depth tutorial on creating hi-res graphics and animation on the Apple computer.
184 pages ISBN 0-88701-007-5
$19.95 book/$9.95 disk/$27.95 book and disk

The Inevitable Beginner's Manual:
Getting to Know Your PC
By Craig Stinson
An introductory guide to the IBM Personal Computer.
128 pages ISBN 0-88701-004-0
$9.95

Macintosh!
Complete
By Doug Clapp
The unique and definitive book on the Apple Macintosh computer.
344 pages ISBN 0-88701-009-1
$19.95

Apple Compote
Produced By Chris Light
A recorded collection of music produced with the Apple and musical peripherals.
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BY ANDREW CHRISTIE

Now: a big, sprawling, tempestuous story of love and hate . . . power and passion . . . struggle and survival . . . in a wild, untamed land; a story that reaches across the generations, embracing countless families, rich and poor; a story of pioneers, tycoons, frontiersmen, prospectors, sailors, artists, revolutionaries, doctors, lawyers, architects, veterinarians, sales clerks, romance novelists . . . and you. This is your life. This is your heritage. This is the unbroken, expanding genetic line leading up to your existence, the study of which is known as genealogy, and which, in the microcomputer world, has drawn a group of enthusiastic practitioners.

A brace of periodicals and a growing number of small software companies now support this labor-intensive hobby. Currently, if you decided to enlist your Apple to aid you in an extensive search of your family tree, you would have your choice of such programs as *Roots/M* from Commsoft, *Apple Tree Genealogy System* from J. Fiske Software Systems, *Family Roots* from Quinsept, *Genie* from Central Research of Utah, or *The Genealogist's Right Hand* from User Friendly Systems.

Then you would start reading up on the subject in general and start ferreting out old records and source documents. Eventually, you would make written inquiries to be run as the genealogical equivalent of classified ads, like these in the Middletown, Pennsylvania-based *Press and Journal*:

Barbara Kelsey Boese—Is searching for proof that Col. William Cook of the 12th Regt., Pa. Line, during the Revolution, who d. in Cumberland Co., Pa. in 1804 had a dau Mary Ann who was b. in Augusta Co., Va. in 1771 and m. in 1795 in Augusta Co., Va. to Wm. Martin.

Marletta Childs—Seeks data on southeastern Pennsylvania families whose members carried the traits of being deaf and dumb. Especially interested in any lines in the counties of York and Lancaster before 1775.

At that point, you may reasonably conclude that you are a buff.

One such is Kathryn Bassett of Pasadena, California, whose corporate handle in computer genealogy circles is Misc. Enterprises. When her stepson is at school and her husband is at work, Kathryn Bassett sits down with just her Apple, her printer, and Violet, her three-legged tabby cat, and charts the course of ancestry, which never did run smooth.

For her, it all began with a vague memory of her maternal grandmother "telling me that my great-grandmother, her husband's mother, was an Indian." The memory came back one day in 1978, in conversation with a lawyer who was a full-blooded Apache. The memory lingered; she had time on her hands, and she finally decided to find out about her mysterious Indian ancestor.

"The first thing I did was call my grandmother, who at first denied she'd ever told me such a thing, but several brothers and sisters affirmed that she had. She gave me a few names and dates to start with; then I went to the Mormon genealogy library in West Los Angeles to find out what I'd need in the way of supplies. I had a brainstorming session with my mom and dad and got some newspaper clippings they had and a family Bible.

"From everything I found out, it looks like great-grandmother was not an Indian, but you get started and you get hooked. Genealogy is very addicting. I'm glad I have the time available to do research, and don't have to do it in addition to working outside the home and being a housewife on top of it."

Among the supplies Kathryn Bassett picked up at that time was a twenty-five-page booklet called *How To Get Organized and Stay That Way* by Mary Schwartz, the only how-to book she has used continuously for six years. As she attests, "If you think you're going to get serious about genealogy, you have to get organized or you'll never get anything done; you'll lose everything."

Her other most important tool is her Apple and her faithful printer (which she refers to, with genealogical aplomb, as a "first-generation Paper Tiger").

"Around the time I started to get interested in genealogy, my former husband was into computers, one of which was a Vector Graphics S-100 system. I thought, 'I might be able to use that,' " a thought shared by quite a few other genealogists in the late seventies. She took the path most of them did, as there were no customized commercial programs available at the time. "I made a little program in Basic, strictly a storage thing. I had to put in every single name and all the data on each person. I put in John Doe and his parents, and when I got to his parents I'd still have to put each parent's name in and have duplicate input."

When her marriage broke up, Kathryn Bassett got custody of the S-100. She eventually sold it to buy an Apple and printer; then she started looking for more to do with them. The first genealogy program she found was *Roots/M* by Commsoft—"a very good program, but it has a limit of 1,000 records per disk, and you can't link your disks together. You have to have one family line on one disk and the other family line on another disk."

While she was looking, she remarried. "My husband didn't want me to work, and I agreed, but I thought there might be something I could do at home to make a little extra without too much effort." She contacted Commsoft and offered her services as a sales representative out of her home, an offer Commsoft took her up on. As she sees it, "Software stores don't want to carry genealogical software because they don't know anything about genealogy." She made the same proposition to all the software companies listed in an issue of a newsletter called *Genealogical Computing*. Quinsept took her up on her offer, and in replying, they also confidently stated that of all the software available she would like their *Family Roots* program the best.

She agreed. "Much as I liked the Commsoft program, I had to admit

Quinsept's was better. It does more and supports multiple data disks. I have mine set up for four marriages and eighteen children per person. I can get 350 records on a disk, a record being all the statistics on one person, with his or her children's names." When she completes her research of her father's line, Rhinehart—of which she has discovered thirty-two spelling variants so far—Bassett will have between five and seven thousand names on disk.

Nuts and Bolts. Computer-assisted genealogy is no different from any other business, vocation, or discipline to which a computer is introduced: The computer is an aid; you still have to do the work. There are steps any genealogist must take.

"Interview your oldest relatives," urges Bassett. "Pick their brains. I recommend this even for people who aren't interested in working on genealogy right now. If you have any inkling that you might be interested in it someday, interview the relatives now. The tapes last, the relatives don't.

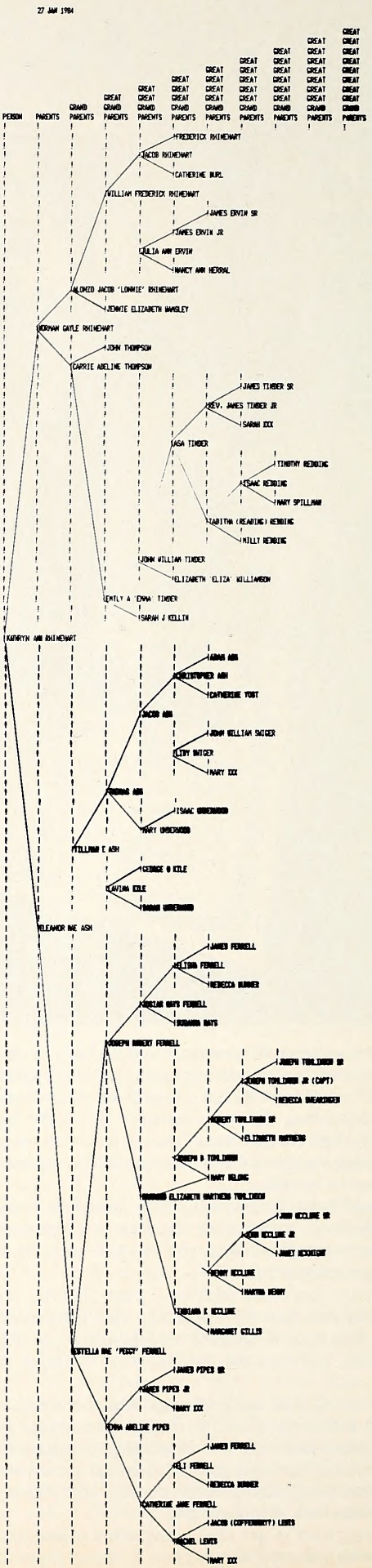
"Then you sit there and go through whatever records you or the relatives might have on hand—birth, death, and marriage certificates. Most people will have their own birth certificates; your parents may have their marriage license. Get your parents' marriage record and birth records; then get your grandparents' death records, birth records, and marriage records, as far back as you can go.

"Say you want to get your grandfather's death record; you don't know when he was born; all you know is he died in the fifties and he was in California. Write the California Office of Vital Statistics, tell them he died around 1955, and they'll search a ten-year-period index. When you get the death record, it'll have a birthdate and a birthplace; sometimes you get lucky and it will give a city or county where he was born; other times, just the state. Then, whether or not you're going to be successful in finding anything further depends on the year of birth. With anything prior to about 1910, you'll probably have to know the county of birth because all the records were filed at the county seats, not at the state capitals."

While the paper authentication of the three main events in an individual's life are nice to get, they will sustain the genealogist only up to a point. Once one gets into a period prior to 1880, depending on the state, there simply aren't any records of births, deaths, or marriages. That's when you turn to the census.

"When you look at microfilm of the census records," says Bassett, "you find most of them are indexed; in 1850 they started listing every member of the household. Before that, the census consisted of 'John Doe, head of household; two males, ages: five through ten ...' They didn't have names."

Are You Sure Alex Haley Got His Start Like This? Sometimes, there are unavoidable and even insurmountable problems, otherwise known as acts of God. The census of 1890 went up in flames before the advent of microfilm. A page here and a page there turn up occasionally, but as far as building a genealogical record goes there is simply a yawn-



Kathryn Rhinehart Bassett's pedigree chart, listing each generation from a single individual in the present back through multiple ancestral lines. A descendant chart would list the growing number of related progeny from a single source.

ing chasm in American family histories between 1880 and 1900. "I wish it hadn't burned," sighs Kathryn Bassett. "I would love to find my father's mother in it. She would have been three years old and I might have been able to find out more about her father. All I know about her father is his name was John Thompson and supposedly he was born in Georgia. It's hard enough tracking relatives by ten-year gaps. When you've got a twenty-year gap, it makes things difficult. However, you persevere.

"In some places, like Indiana, birth records are closed to the public. You can't go in and look something up yourself because they have illegitimate births filed with those in wedlock. Now, of all the people I know who are interested in genealogy, no one cares if an ancestor was illegitimate. But a lot of people would get absolutely paranoid if such information were to get out about their families, so I can kind of see their reasoning. If you looked in the Vital Statistics microfilm records for any county in Indiana you'd find a notation that it has been pulled because of the privacy act. They will give you the information, but they look it up, not you, and you have to sign a form stating that you're a relative. Just a couple of states do that, so it doesn't interfere that much. Also, the Mormons microfilm everything for posterity, so it's no big thing."

Since it has already come up twice in this story, let it here be explained that the Mormon church is the savior of every genealogist in America, maintaining the most impressive body of personal records in the country, kept in a vault dug out of a granite mountain in the environs of Salt Lake City, Utah. "Unless a nuclear bomb made a direct hit on the vault itself, all those records would be perfectly preserved," marvels Bassett. "In the main library, the researchers have more than a million rolls of microfilm and several hundred thousand books. They have been going around the country for a number of years, starting in the east and

going county by county, getting any permission needed to microfilm all vital records; everything of genealogical value that a courthouse would have. If you want an old birth certificate from Doddridge County, West Virginia, and the courthouse has burned down, you're out of luck—unless the Mormons got there first and microfilmed it."

Is this a vocation only a Ph.D. or research scientist could love? For Kathryn Bassett, who found college not to her liking and left after a year, it isn't if you go about it the right way. "When you start getting into things like county histories, you've usually done enough research that it's not that intimidating," she asserts. "If you walk into the Southern California Genealogical Society Library in Burbank and you see all these books, you think, 'Gee, I can go in there and look up my family history.' Well, I didn't even use book-type parts of libraries until I'd been doing research for a couple of years, because first of all you need to get all the information contained in birth, death, and marriage records, and that's not in a book. For census records you need to go to the largest libraries with microfilm records, or to a Mormon center, or to the National Archives in Washington.

"Last year I extended my line back three generations on three different lines by pure luck."

Should you ever get completely frustrated and hit a dead end on one line, Bassett recommends working on another one for a while. Each generation doubles, so there should always be someone to be working on. She started with her mother's family, surnamed Ash, found several distant cousins, and also found that they were doing the same thing she was. Avoiding duplicate input, she put the Ashes on hold to work on the Rhineharts, her father's side.

At this juncture, an old tradition and an invaluable tool of the American genealogist came into play: the family reunion, especially as it is practiced in Middle America. The Rhinehart clan gathers en masse in Heekin Park in Muncie, Indiana, every year, and has been doing so officially since 1917. Kathryn Bassett attended and got all the pertinent information on everybody and his brother, so to speak. In the case of the Ashes, her task was made easier by the work of the distant cousins, who shared their info with her. One discovered a ship's passenger listing for a Johann Adam Esch, who came to America in 1772, and deduced that he was the same person as Adam Ash, who served as a private in the Revolution. Anyone who can prove she's a descendant of Adam Ash, Revolutionary War veteran, is eligible for the D.A.R., with access to all its records. The number of current qualifying individuals can only be guessed at, as Adam Ash had thirteen children. Cousin Arvil Ash kept figures on Adam's descendants through several lines, which Bassett has transferred to family group sheets—listings of father's name, mother's name, birth and death dates, and a list of all children with their information; they're easier to follow than a straight narrative. She has one notebook full of all Adam Ash's descendants through Christopher Ash, her direct ancestor, and another notebook of all descendants through offspring other than Christopher Ash.

With the Rhineharts and the Ashes already occupying several floppy disks, she is now working on her husband's line and has gotten back to great-grandfather Samuel Adison Bassett.

"All I'd been able to find out was that his mother's name was Mahala. It was on his marriage record—she had to sign it because he was underage. Maybe she was a widow, because she signed instead of his father. I talked to more relatives and found Samuel's father's name was Oliver. A Bassett came over on the *Fortune* in the colonial days. A lot of organizations keep records from that time, so I figured that if I could find his name I could connect it with a lot of colonial Bassett information. No luck. I could find no Oliver Bassett.

"Now I'm hoping to find Oliver's father."

What are the solid results of a computer genealogist's labors? Usually, a large, hardbound book is produced, published at the genealogist's expense and sold to relatives. Kathryn Bassett is considering offering a service whereby she would input the ancestral data of other people's families into the Apple at twenty-five cents per name record plus a twenty-five-dollar startup fee.

These results are clearly secondary. This line of study, open to all, goes on simply because everyone has roots, because it is an affirmation of the continuity of life, because humanity will always be fascinated by the most literal kind of immortality available to it.

"You know," she muses, "everybody in the world is related eventually. The whole thing is a giant jigsaw puzzle." ■

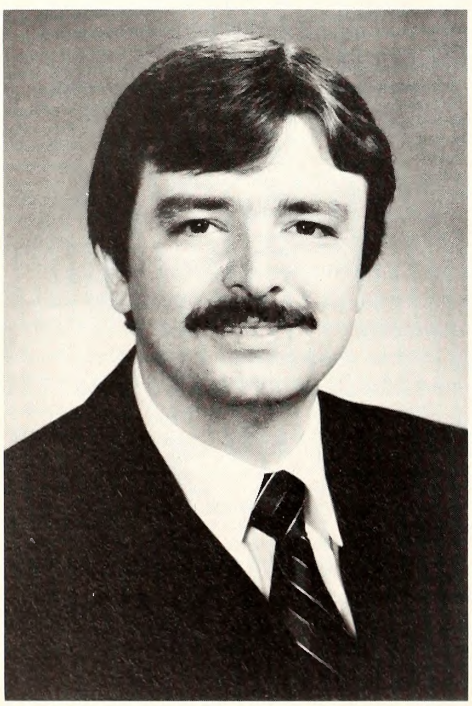
BY TOMMY GEAR

The Future through a Hayes

"With time modems are going to get less expensive, they're going to get faster, and they're going to get smarter. We're going to see technological advances that will allow prices to come down without sacrificing profits."

Dennis Hayes, founder and president of Hayes Microcomputer Products, ought to know. His company set the standard for modems way back in 1977. Although there's great promise in telecommunications, Hayes says, it's difficult to say just how or when it's going to be fulfilled.

"People have been asking me for five years if computers are going to have built-in modems like they have disk drives, and I just don't think so. Some computer companies are beginning to recognize the importance of communications, and particularly with the portable computers you'll start seeing built-in 300-baud or 1200-baud modems, such as in the Grid.



Dennis Hayes, founder and president of Hayes Microcomputer Products, credits his company's success to its emphasis on quality, value, and service to its users.

"But in general-purpose computer systems you won't see many built-in modems because a lot is happening now in modem technology. And modems increase the cost of the computer. Another issue is what modem should be built in. Should its baud rate be 300, 1200, 2400, or something else? With the Macintosh, you've got the communication port provided and you attach externally any modems that would be appropriate for your use."

Demodulating the Future. For the most part, the future of telecomputing won't be determined by how manufacturers are configuring the products, according to Hayes. The future is ultimately decided by the users—their needs and their willingness to take advantage of the various options telecommunications makes possible. Hayes recognizes that "a large number of users are realizing the value of telecomputing—being able to connect to a network or database and extract the data they need."

More and more professionals are using electronic mail. "We'll see an increasing demand for the ability to communicate in a timely way and pick up messages at your convenience," Hayes predicts.

"As people get more experience using electronic mail, I think we'll see it taking on slightly different forms. The distribution of such mail will be addressed, as well as the confirmation of the delivery of messages. There's an advantage there in that it will take a load off the post office that it doesn't need to carry. Messages can be delivered that don't have to be put into envelopes, stamped, and handled."

Hayes started assembling modems for sale at home on his dining room table in 1977. At that time, neither modems nor personal computers were quite the hot items they are today. "The problem we had in the beginning," Hayes recalls, "was who was there to talk to with a modem?"

When the Apple appeared on the scene, Hayes saw a whole new market opening up. The machine had expansion ports and a reliable power supply. He jumped in head first and was soon selling a ton of modems—first the highly successful Micromodem, then Micromodem II, and now Micromodem IIe and Smartmodem. At the time of *Softalk*'s profile of Hayes Microcomputer Products in November 1981, the company was on top of the microcomputer telecommunications world.

Located in Atlanta, Georgia, Hayes Microcomputer Products has remained a competitive, viable force in the market. The company has benefited greatly from Dennis Hayes's belief in combining the best of Western and Far Eastern business techniques. A long-time admirer of Japanese management style and manufacturing efficiency, Hayes has traveled to Japan to see their methods close up.

"In Japan I found a very energetic group of people working very hard—there's no magic in it. The best Japanese management studied the best American management. A lot of things they learned came originally from American companies. It certainly affected our thinking at Hayes, though."

Back home in Georgia, the Japanese ideas Hayes admired took on a distinctively American cast. "Where the Japanese talked about harmony in the workplace, I would talk about teamwork and a cooperative approach to problem solving, as opposed to a confrontation approach to problem solving.

"In the confrontation mode, it's either win or lose," Hayes continues. "If approached in a cooperative sense, there's probably some truth to both sides of an issue, and there's never a simple compromise. A solution that would incorporate the concerns of both creates a new synthesis, and with that approach you end up with a better solution.

"If the subject you're talking about is a feature in a product, then that synthesis becomes important to the user of that product. The reason the Smartmodem ended up having the qualities and features that it does is because we went through many conflicts between things like costs and capabilities and solved them in a cooperative way. The synthesis incorporates the concerns of people in marketing, engineering, and production.

"A lot of people see Hayes as a modem company," says Hayes. "I don't see us as just a modem company. I see us as providing solutions. That's why we got into software. A modem can do so much, but you need a program in the computer to take full advantage of it." *Smartcom I* is Hayes's premier software product for the Apple market. It's a terminal software package that helps you place calls to remote systems, store phone numbers, and answer calls automatically. It works with standard DOS, as well as CP/M and Pascal.

A Modern Renaissance Man

"I don't think that the creative innovators at this point in time are in the art world," says video artist Steve Beck. "They're in the marketplace, and a lot of them are in the computer industry."

If Apples had been around at the time of the Renaissance, there's no doubt that a man like Leonardo da Vinci would have been among the first to get his hands on one. Five hundred years later, personal computing provides a versatile means of expression to creative, multitalented people like Steve Beck—people who choose not to succumb to twentieth-century pressures to specialize. Artist, inventor, electrical engineer, software developer—Beck is all of these.

The art seems to mesmerize the artist as Steve Beck enters the throes of creation with his Apple.

In the late 1960s and early 1970s Steve Beck was enjoying a career as a successful video artist. Working at the National Center for Experiments in Television, under a grant provided by the National Endowment for the Arts, Beck developed a video synthesizer. Many of his video pieces have been aired on PBS over the years. They can also be found in art collections around the world.

Softalk first introduced readers to Beck and his hardware/software development company, Beck-Tech, in November 1981. At that time Beck-Tech was three years old and already becoming as diverse as the man who founded it. Consider for a moment just one of Beck-Tech's areas of focus: energy management.

"There are about three thousand of our systems in the United States alone, with Apples being used as communications central. We've been amazed at how much performance is being squeezed out of the Apple II in this role. Some of the Apples are handling up to thirty stores."

The function of energy monitoring has traditionally been carried out by mechanical devices without any kind of centralized control. With the systems developed by Beck-Tech, a regional supervisor can use an Apple to dial up individual stores over standard phone lines and monitor or alter factors affecting energy consumption, like the overall temperature levels in a store, or in specific places, like individual frozen food cases. If any energy management systems are not functioning properly, this information is relayed automatically to the Apple and can then be promptly remedied, reducing the risk of irreparable product damage.

The company's first business communications product is Datalink, a battery-operated, hand-held terminal with a built-in modem and mini QWERTY keyboard. Easily carried around by travelers who might wish to tap into The Source or Dow Jones, Datalink is designed to talk to a serial card with the standard terminal software. Since Datalink's introduction a year ago, Bech-Tech has created several applications packages for Apples that talk to the Datalink terminals. Among these are a messaging system, an order-entry system, an electronic mail package, and a banking system.

Like many other software developers, Beck is intrigued by Lisa Technology and the Macintosh.

"One of our first goals as soon as we can get our hands on a Macintosh is to take the software we've developed on the Apple II and write equivalent programs for the Mac as a communications center. I see the biggest application for Datalink in the area of electronic mail. I really think 1984 is going to be the year for electronic mail."

Where Ya' Going with that Video Camera, Steve? Later this year, Beck will release *The Direct Video Album* on his own Electron label and thereby bring his video work to a wider audience. The album includes a collection of Beck's best video works for VHS, Beta, and laser disk formats. Another album in the works includes video works by Beck and other artists scored to the innovative music of sixties guitarist Jimi Hendrix.

"I'm always looking for insights into the visual language. How can we really communicate with another culture that doesn't speak our language or read our writing? The only hope is to hit upon some of the key terms of what can be called a visual language: certain images—Jung called them archetypal—that resonate and have meaning for all humans.

"All of this comes right back to certain things that have a direct bearing on writing software and making it a more meaningful connection between a user's concept and the achievement of his desired results. In the end, what it comes down to is a matter of definition and clarity of thought."

MacVincis on the Horizon. Beck believes that the icon approach of the Macintosh's user interface may be a decisive step toward a more highly developed visual language.

A modern renaissance man.

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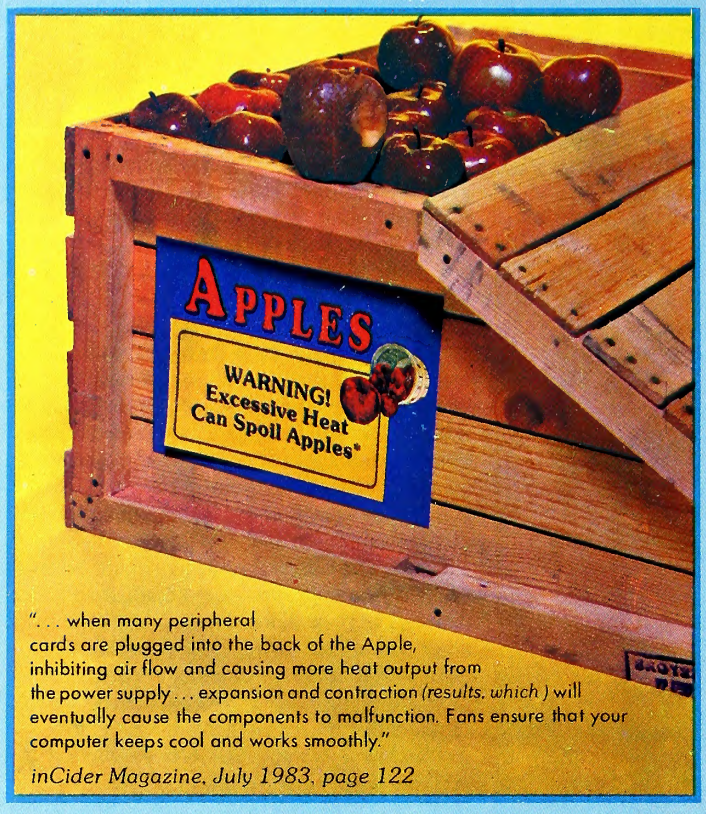
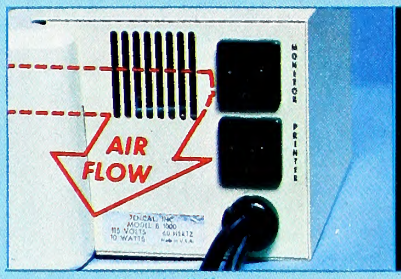


"... when many peripheral cards are plugged into the back of the Apple, inhibiting air flow and causing more heat output from the power supply ... expansion and contraction *(results, which)* will eventually cause the components to malfunction. Fans ensure that your computer keeps cool and works smoothly."

inCider Magazine, July 1983, page 122

Patent pending



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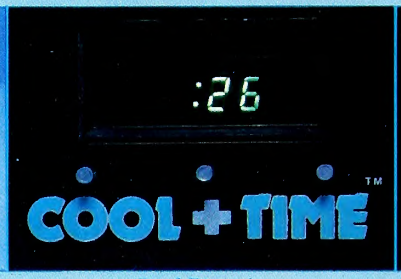

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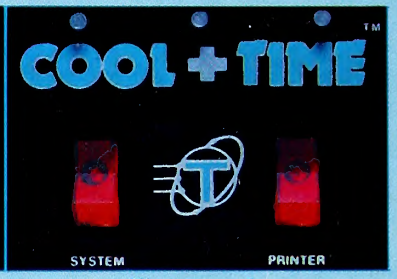

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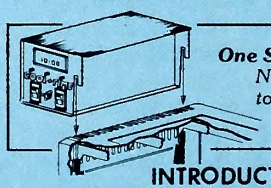

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The master key to every DOS 3.3 disk is the volume table of contents, or VTOC (say vee-talk). The VTOC can always be found in sector 0 of track 17 ($11) on DOS 3.3 disks. The VTOC supplies DOS with some important information about a disk. Our main objective this month is to take a look at the VTOC's disk sector map and find out how it can be used—even by a simple Basic program—to determine the number of free sectors on a disk.

In addition to the disk sector map, the VTOC contains other interesting stuff, including where the catalog starts, how many tracks and sectors the disk has, and what track was last used for saving data. Figure 1 shows an annotated decimal display of the beginning of a typical VTOC.

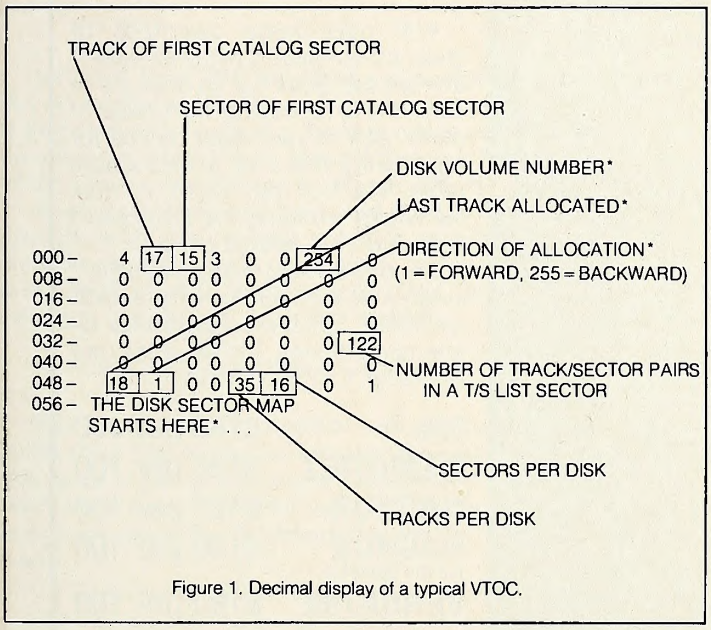

Figure 1. Decimal display of a typical VTOC.

Inside DOS there is a 256-byte buffer where the VTOC of the disk currently being accessed (or last accessed) is kept. This buffer starts at byte 46011 ($B3BB). Whenever a new disk is initialized, the contents of this buffer are written into the VTOC of the new disk. The incredible thing is that a large part of this new VTOC isn't new at all—it's a copy of the VTOC of the last disk accessed.

Grandfather VTOC. In figure 1, only those items marked with an asterisk (the disk volume number, the last track allocated and direction of allocation, and the disk sector map) are updated during an init. All the other bytes shown are simply passed down through the generations.

For example, take that first byte. On every DOS 3.3 disk we've ever seen, that byte contains a four. But nobody knows why. DOS itself never uses this byte. The fourth byte in the table is supposedly the DOS version number. On DOS 3.2 disks, this byte held a two. It hardly matters what's there—DOS never uses it. And the last two bytes shown in the figure reportedly represent the number of bytes in a sector (in backward hexadecimal notation those bytes equal 256). But again, DOS makes no effort to put those values there when a new disk is initialized and never refers to them at any other time.

Even more amazing are the numbers Uncle DOS refers to in his daily activities but doesn't purposefully set when a new disk is initialized. The second and third bytes, for example, point to the disk's first catalog sector. Every time a disk is catalogued, DOS looks here to find out where the catalog is.

By changing these numbers, you can actually move the catalog to another track (except track 0) or have it start at an unusual sector. But don't do it unless you love trouble. If you use a disk with a relocated catalog just before initializing a new disk, the new disk won't work right. This is because DOS doesn't correct the catalog pointer in the VTOC during an init—it just uses what's already there. The newly initialized disk's catalog will be in track 17, but the VTOC will *say* the catalog is elsewhere; DOS will be unable to find it.

Some of you may have noticed a similar problem when reinitializing Pascal, CP/M, or ProDOS disks for use with DOS 3.3. If you attempt to catalog the disk just before initializing (to make sure it is the disk you thought it was), you'll load DOS's VTOC buffer with whatever trash is in track 17, sector 0, on the disk. This trash will be transferred to your new disk by the init command. The newly initialized disk will fail to work correctly.

To avoid this problem, always catalog a good DOS 3.3 disk just before entering the init command.

Counting the Free Sectors. The VTOC's disk sector map is a *bit map*. In this kind of map, one bit is used to describe the status of each item in the map. In the VTOC's disk sector map, each sector on the disk is assigned a bit, and that sector's status—free or in use—can be determined by looking at it. If the bit is set to 1, the sector is free; if set to 0, the sector is in use.

Bit maps are not easy to use from Basic. Basic has no commands for examining the status of individual bits. Machine language, on the other hand, has several bit-level instructions that DOS uses when reading or changing the bit map.

Basic programmers actually have to take a byte apart to discover the

status of its individual bits. The following listing shows a brute force method of testing a byte's bits using Basic:

```
10 PRINT : INPUT "BYTE VALUE: ";B$ : PRINT
20 IF LEN(B$)=0 THEN END
30 B=VAL(B$) : IF B<0 OR B>255 THEN PRINT "RANGE ERROR" :
   GOTO 10
35 GOSUB 40 : GOTO 10

40 REM ** BRUTE FORCE BIT TESTER **
41 IF B> 127 THEN B=B- 128 : PRINT "BIT 7 SET"
42 IF B>  63 THEN B=B-  64 : PRINT "BIT 6 SET"
43 IF B>  31 THEN B=B-  32 : PRINT "BIT 5 SET"
44 IF B>  15 THEN B=B-  16 : PRINT "BIT 4 SET"
45 IF B>   7 THEN B=B-   8 : PRINT "BIT 3 SET"
46 IF B>   3 THEN B=B-   4 : PRINT "BIT 2 SET"
47 IF B>   1 THEN B=B-   2 : PRINT "BIT 1 SET"
48 IF B>   0 THEN B=B-   1 : PRINT "BIT 0 SET"
49 RETURN
```

This method is possible because each bit in a byte represents a specific value, as shown in the table in figure 2. For example, if a byte is equal to or greater than 128, then that byte's seventh or 128s bit *must be* set.

In binary:	1	1	1	1	1	1	1	1	
Place value:	128s	64s	32s	16s	8s	4s	2s	1s	
In decimal:	128	+ 64	+ 32	+ 16	+ 8	+ 4	+ 2	+ 1	= 255
Bit number:	7	6	5	4	3	2	1	0	

Figure 2. Digit values of binary numbers.

Figure 3 shows a decimal display of a typical VTOC, including the beginning of the free space bit map. This disk is a new one—tracks 0 through 2, the DOS tracks, are shown in use (all bits=0; byte value=0). All sectors in tracks 3 through 16 are free (all bits=1; byte value=255). Track 17, the catalog track, is in use.

000–	4	17	15	3	0	0	254	0
008–	0	0	0	0	0	0	0	0
016–	0	0	0	0	0	0	0	0
024–	0	0	0	0	0	0	0	0
032–	0	0	0	0	0	0	0	122
040–	0	0	0	0	0	0	0	0 TRACK 0
048–	18	1	0	0	35	16	0	1 TRACK 1
056–	0	0	0	0	0	0	0	0
064–	0	0	0	0	255	255	0	0
072–	255	255	0	0	255	255	0	0
080–	255	255	0	0	255	255	0	0
088–	255	255	0	0	255	255	0	0
096–	255	255	0	0	255	255	0	0
104–	255	255	0	0	255	255	0	0
112–	255	255	0	0	255	255	0	0 TRACK 17
120–	255	255	0	0	0	0	0	0

and so on . . .

Figure 3. Decimal display of a typical VTOC, including a portion of the disk sector map.

As you can see in this table, each track is allocated four bytes in the bit map. Four bytes hold thirty-two bits—thus the bit map was designed to accommodate as many as thirty-two sectors in each track. Since DOS 3.3 disks have only sixteen sectors per track, only two of the four bytes are actually used. The table in figure 4 shows the relationship between the bits in these two bytes and the sectors they represent.

	First Byte								Second Byte							
Bit number:	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sector:	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Figure 4. Relationship of bits to sectors in VTOC disk sector map.

Elementary Map Reading. To determine how much free space is on a disk, all you have to do is count the number of bits in the free space map that are set to one. This task is greatly simplified, since DOS loads the VTOC of every disk it uses into an internal buffer. As mentioned earlier, this buffer begins at byte 46011 ($B3BB). The free space bit map

lies inside this buffer, beginning at byte 46067 ($B3F3). Figure 5 shows how you can take a look at it by simply entering the Monitor and asking for a memory dump.

```
]CALL ** - 151
B3F3.B47F
                    TRACK 0
B3F3- 00 00 00 00 00          TRACK 1
B3F8- 00 00 00 00 00 00 00 FF
B400- FF 00 00 FF FF 00 00 FF
B408- FF 00 00 FF FF 00 00 FF
B410- FF 00 00 FF FF 00 00 FF
B418- FF 00 00 FF FF 00 00 FF
B420- FF 00 00 FF FF 00 00 FF
B428- FF 00 00 FF FF 00 00 FF  TRACK 17
B430- FF 00 00 FF FF 00 00 00
B438- 00 00 00 00 00 00 00 FF
B440- FF 00 00 FF FF 00 00 FF
B448- FF 00 00 FF FF 00 00 FF
B450- FF 00 00 FF FF 00 00 FF
B458- FF 00 00 FF FF 00 00 FF
B460- FF 00 00 FF FF 00 00 FF
B468- FF 00 00 FF FF 00 00 FF
B470- FF 00 00 FF FF 00 00 FF  TRACK 34
B478- FF 00 00 FF FF 00 00 00
```

Figure 5. Monitor dump of disk sector map in DOS VTOC buffer.

In order to calculate the number of free sectors on a disk, just get DOS to read the disk with *catalog* (or any other command that activates the disk drive—the idea here is to get the disk's VTOC loaded into the buffer), then count the number of bits set in the bit map. If we use a modified version of our brute force bit tester (one that counts the bits rather than sending us messages about them), the code for peeking at the bit map would look something like this:

```
12 FS=0
14 FOR ADR=46067 TO 46067 + ((35-1)*4) STEP 4
16 B=PEEK(ADR)     : GOSUB 40
18 B=PEEK(ADR+1) : GOSUB 40
20 NEXT : RETURN

40 REM ** BRUTE FORCE BIT TESTER **
41 IF B>127 THEN B=B-128 : FS=FS+1
   and so on . . .
```

However, since DOS will never use any sectors in track 0, *even if they are marked as free*, there is no reason to count those bytes. In fact, if we do count them, and they for some reason indicate a sector is free, the amount of free space the program finds will be deceptive. We may think we have a few more sectors left, but DOS will insist the disk is full.

Another consideration is that a good free space program should automatically adapt itself to disks that have more than thirty-five tracks. Since the number of tracks on the disk is readily available in the VTOC at byte 46063 ($B3EF), as shown in the VTOC display in figure 1, a better way to loop through the bit map would be:

```
14 FOR ADR=46071 TO 46067+((PEEK(46063)-1)*4) STEP 4
```

This looping method, combined with the brute force bit tester, requires about four seconds to determine the amount of free space on a disk. Some of you wizards out there can probably figure out how to do it faster now that you know what's involved. Listing 1 shows the complete brute force subroutine for determining the free space on a disk from Basic.

```
10 IF PEEK(978)<>157 THEN PRINT "CAN'T COUNT FREE SECTORS;
   DOS MOVED." : RETURN
12 FS=0
14 FOR ADR=46071 TO 46067+((PEEK(46063)-1)*4) STEP 4
16 B=PEEK(ADR)     : GOSUB 40
18 B=PEEK(ADR+1) : GOSUB 40
20 NEXT
22 PRINT FS;" FREE SECTORS"
24 RETURN

40 REM ** BRUTE FORCE BIT TESTER **
41 IF B>127 THEN B=B-128 : FS=FS+1
42 IF B> 63 THEN B=B- 64 : FS=FS+1
43 IF B> 31 THEN B=B- 32 : FS=FS+1
44 IF B> 15 THEN B=B- 16 : FS=FS+1
45 IF B>  7 THEN B=B-  8 : FS=FS+1
46 IF B>  3 THEN B=B-  4 : FS=FS+1
47 IF B>  1 THEN B=B-  2 : FS=FS+1
48 IF B>  0 THEN B=B-  1 : FS=FS+1
49 RETURN
```

Listing 1. Basic free space subroutine.

Catalog with Free Sectors. One of the handiest of all DOS modifications gets the file manager to display a disk's free space every time a disk is catalogued. To modify DOS, of course, we have to descend into the murky world of assembly language. Otherwise, the principles are the same as the ones we have already used.

If you have no interest in assembly language, skip the following listing but read the rest of this column. Near the end there's a Saint Patrick's Day program that will add a leprechaun to your DOS. He'll tell you how much disk space you have every time you do a catalog. Now, for those of you who are interested, listing 2 shows an assembly language subroutine that does in a few microseconds what slowpoke Basic takes four seconds to do.

```
                    1000 * ---------------------------------------------------
                    1010 *   DISK FREE SPACE LEPRECHAUN
                    1020 *
                    1030 *      BY TOM WEISHAAR
                    1040 *      DOSTALK MARCH 1984
                    1050 * ---------------------------------------------------
                    1060 ;
                    1070         .OR $ADC0
ADC0- 20 B3 B6      1080         JSR    FREESPC  ;Patch DOS catalog routine so it
                                                    JSRs to our new free space
                                                    calculator right after loading
                                                    byte $44 with the disk's volume
                                                    number.
                    1120 ;
                    1130         .OR $B6B3
                    1140 FREESPC
B6B3- 20 42 AE      1150         JSR    $AE42    ;convert volume number to deci-
                                                    mal and print it (used to be at
                                                    $ADC0)
B6B6- 20 48 F9      1160         JSR    $F948    ;call routine in Monitor that prints
                                                    3 blanks
B6B9- A9 00         1170         LDA    #0       ;clear bytes
B6BB- 85 44         1180         STA    $44      ;  $44 and $45
B6BD- 85 45         1190         STA    $45      ;(decimal 68-69)
B6BF- AC EF B3      1200         LDY    $B3EF    ;get VTOC byte with number of
                                                    tracks on disk
B6C2- 88            1210         DEY             ;subtract one
B6C3- 98            1220         TYA             ; /
B6C4- 0A            1230         ASL             ; /multiply by four
B6C5- 0A            1240         ASL             ; /
B6C6- A8            1250         TAY             ;Y register now holds (# of
                                                    tracks - 1) * 4
B6C7- A2 08         1260 .1      LDX    #8       ;X register holds the number of
                                                    bits in a byte (8)
B6C9- B9 F6 B3      1270         LDA    $B3F6,Y  ;load byte from bit map, looping
                                                    from end of map to start
B6CC- 0A            1280.2       ASL             ;shift bit 7 into carry
B6CD- 90 06         1290         BCC    .3       ;  if bit in carry is zero, branch
B6CF- E6 44         1300         INC    $44      ;bit is a one, so add one to the
                                                    count of free sectors
B6D1- D0 02         1310         BNE    .3       ;if incrementing byte $44 makes it
                                                    equal zero, add one to byte $45
B6D3- E6 45         1320         INC    $45      ;  ($00FF+1 = $0100)
B6D5- CA            1330.3       DEX             ;decrement bit counter
B6D6- D0 F4         1340         BNE    .2       ;  if not zero yet, go back and
                                                    check next bit
B6D8- 88            1350         DEY             ;decrement track counter
B6D9- D0 EC         1360         BNE    .1       ;  if not zero yet, go back and do
                                                    next byte of map
B6DB- 20 42 AE      1370         JSR    $AE42    ;convert $44-$45 to decimal and
                                                    print
B6DE- A0 0C         1380         LDY    #12      ; /
B6E0- B9 EA B6      1390 .4      LDA    .5,Y     ; /This part prints the words
B6E3- 20 ED FD      1400         JSR    $FDED    ; /  " FREE SECTORS"
B6E6- 88            1410         DEY             ; /  after the number.
B6E7- 10 F7         1420         BPL    .4       ; /
B6E9- 60            1430         RTS             ;return to catalog routine
B6EA- D3 D2 CF
B6ED- D4 C3 C5
B6F0- D3 A0 C5
B6F3- C5 D2 C6
```

```
B6F6- A0          1440 .5    .AS - "SROTCES EERF"
```

Listing 2. Assembly language free space leprechaun.

This free space program uses a DOS subroutine at byte 44610 ($AE42) that is supposed to convert a two-byte hexadecimal number stored at bytes 68 and 69 ($44-$45) into decimal and print it. The subroutine is used when catalog displays a disk's volume number and when it displays the sector length of files. The only problem with it, as you may already know, is that it doesn't work correctly with numbers larger than 255.

Apple's *DOS Programmer's Manual* (page 153) indicates this is because DOS doesn't correctly store a file's sector length in the catalog. However, the manual is mistaken. The problem is a bug in the DOS subroutine itself.

In order for our disk free space patch to work correctly, we also have to fix the bug in the hexadecimal to decimal subroutine. Fortunately, a fix for this subroutine was published in *Call -A.P.P.L.E. In Depth #3: All About DOS*. The author of the fix, Richard D. Norling, and the folks at *Call -A.P.P.L.E.* have given us permission to repeat the patch here. We will do so shortly. If you want to know how it works, see *All About DOS*, page 197.

Another problem with our free space patch is that we are putting it in an area inside DOS, $B6B3 to $B6FC, that is normally, but not always, available for use. In addition to the many programs that use this space, the latest version of DOS 3.3, as we saw last month, uses its first twenty-eight bytes. We'll have to test to make sure this area is empty before installing the patch. If the newest version of DOS 3.3 is found, you can still squeeze the patch in. But you'll have to banish the "free sectors" message. In this case, you'll just have to *know* what that little number to the right of the disk's volume number is.

A final point of small importance about the free space patch is that it checks all four bytes in the disk sector for each track. Our Basic routine only checked two of the four, but this was to save time. It would take more space to avoid checking all four in assembly language, and space is at a premium here. The difference in execution speed wouldn't be noticeable anyhow.

Free Space Finale. Listing 3 shows a Basic program that tests to make sure the area at $B6B3 is empty, and, if so, installs the disk free space patch and fixes the DOS hexadecimal to decimal conversion routine.

When typing in the C$ strings, it is important that you put at least one space between each hexadecimal number. However, it *isn't* necessary to use more than one space or to line the numbers up in columns as we have done here—that's just so you can read the strings more easily.

```
10 REM ----------------------------------------
11 REM DISK FREE SPACE
12 REM PATCH
13 REM ----------------------------------------

20 IF PEEK(978)<>157 THEN PRINT "CAN'T EXECUTE; DOS HAS
   BEEN MOVED." : END
30 FOR I=0 TO 27 : VER = VER + PEEK(46771+I) : NEXT
40 IF VER=0 OR VER=4899 THEN GOTO 60
50 PRINT "CAN'T EXECUTE; DOS ALREADY PATCHED." : END
60 PRINT "ONE MOMENT PLEASE . . ." : PRINT

100 REM ** FIX HEX TO DECIMAL ROUTINE **
110 C$="ADAF:0C N ADB1:AE N ADB7:D0"
115 GOSUB 500
120 C$="AE42: A0 02 A9  B0 48 A5  44 D9 A4  B3 A5 45
              E9 00 90  10 85 45  A5 44 F9  A4 B3 85
              44 68 18  69 01 48  D0 E5 68  20 ED FD
              88 10 DB  60"
125 GOSUB 500

200 REM ** NORMAL FREE SPACE PATCH **
210 IF VER=4899 THEN 300
220 C$="ADC0:20 B3 B6"
225 GOSUB 500
230 C$="B6B3: 20 42 AE  20 48 F9  A9 00 85  44 85 45
              AC EF B3  88 98 0A  0A A8 A2  08 B9 F6
              B3 0A 90  06 E6 44  D0 02 E6  45 CA D0
235 GOSUB 500
240 C$="B6D7: F4 88 D0  EC 20 42  AE A0 0C  B9 EA B6
              20 ED FD  88 10 F7  60 D3 D2  CF D4 C3
              C5 D3 A0  C5 C5 D2  C6 A0"
245 GOSUB 500
250 PRINT "DISK FREE SPACE PATCH INSTALLED." : END

300 REM ** CONDENSED FREE SPACE FOR NEWEST DOS 3.3 **
310 C$="ADC0:20 CF B6"
315 GOSUB 500
320 C$="B6CF: 20 42 AE  20 48 F9  A9 00 85  44 85 45
              AC EF B3  88 98 0A  0A A8 A2  08 B9 F6
              B3 0A 90  06 E6 44  D0 02 E6  45 CA D0
              F4 88 D0  EC 4C 42  AE"
325 GOSUB 500
330 PRINT "DISK FREE SPACE PATCH INSTALLED." : END

500 C$=C$+" N D9C6G"
510 FOR I=1 TO LEN (C$) : POKE 511+I, ASC(MID$(C$,I,1))+128 : NEXT
520 POKE 72,0 : CALL -144 : RETURN
```

Listing 3. DOS free space patcher.

This program uses the popular S.H. Lam technique in lines 500 through 520. The C$ strings are actually Monitor commands. Line 510 pokes the strings into the keyboard input buffer; line 520 tricks the Monitor into executing them as if they had just been typed on the keyboard. The little ditty we add to each string in line 500 gets the Monitor to pass control back to our Applesoft program. Using this technique minimizes the amount of typing necessary to enter the program. If you know for certain which version of DOS you have, it will be necessary to type in only the strings for your version.

After running this program you can make the free space patch permanent by initializing a new disk. The DOS on the new disk will include the patch—bring it to life by booting the disk.

An alternative way to find out how much space is on a disk, of course, is to use *FID* on the DOS 3.3 System Master disk. ProDOS and Pascal include a disk free space report as standard catalog equipment.

That's it for this month. Next month we'll do a little April Fooling around. See you then.

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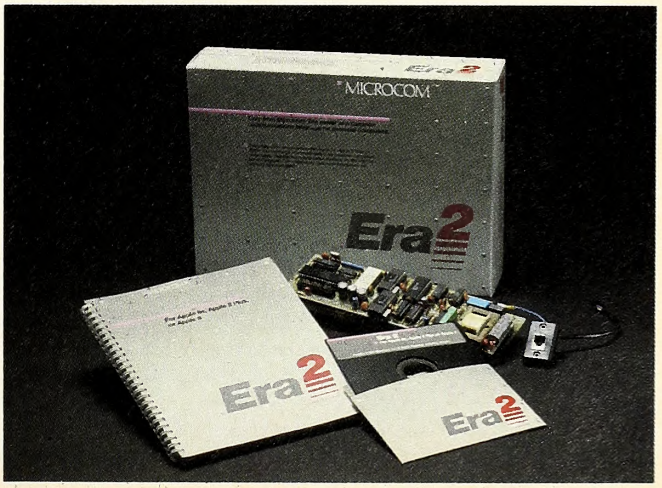

Apple II owners who have an opportunity to use a Lisa or a Macintosh may be charmed by the new machines, but they'll probably decide to stick with their Apple IIs. Once you've invested so much time in getting to know a machine inside and out, you think of it as part of yourself. Besides, it's always difficult to switch word processors, and if you use a word processor a lot, you'll probably find some favorite feature absent from *MacWrite*. Nevertheless, the next time you sit down to your favorite Apple II word processor, you might be chagrined to find yourself reaching for a phantom mouse.

The first reaction is always, "I don't need a mouse. I want to keep my hands on the keyboard." But after a few exposures to mousing, one of your hands begins to "think" differently. It consistently misses the cursor control keys by a good six inches.

Cheese It! Now—or soon, considering it's on Apple Standard Time—there's a mouse for the Apple II. The AppleMouse II looks just like the Macintosh mouse: It has the same nicely beveled case in Apple beige, and the same big gray button. Underneath it has the same rubber-coated steel ball. A plastic locking ring holds the ball within its alcove, and gravity, when the mouse is right-side up on the desk, holds the ball against the two internal wheels that detect horizontal and vertical motions and convert them into signals to the computer. Turning the locking ring a few degrees allows the ball to pop out so that it and the rollers can be freed of dust periodically. This seems to be the only maintenance the mouse requires.

Of course the mouse is no good without software to read it. While various developers are working on original mouse-based software and revisions of existing programs, the first program for the mouse comes as part of the package. This is not Apple's typical hardware demonstration program; it's a full graphics tool by Bill Budge that bears a striking resemblance to *MacPaint* on the Macintosh.

If *MacWrite* doesn't cause Apple II word processing aficionados to convert to the Mac, *MacPaint* will tempt many a computer artist. One look at Budge's *MousePaint*, however, may just bring them back. It doesn't have all the features of *MacPaint*, but it has many of them. More important than individual features, it captures the spirit, the style, the ease of use, and even most of the speed. Most important, it has one thing *MacPaint* lacks: color.

Behind the Color Mac. *MousePaint* is a freehand drawing program. Through the use of various tools, the movements of the mouse are converted into brush strokes, lines, curves, patterns, and shapes. In some ways, using *MousePaint* is easier than drawing on paper. For instance, the eraser doesn't leave rubbings behind or wear a hole in the page no matter how often you use it. A magnified mode called Fatbits blows up a section of the screen and allows dots to be turned on and off individually. It also allows very fine control of all the other drawing modes. An undo command deletes your last action from the screen, not only erasing the errant brush stroke but restoring the picture underneath it.

If you want to move or copy part of a picture, you can draw an editor's box around it. With the box around something, you can move it by dragging it around with the mouse without disturbing the background you drag it over. Or you can copy it into a buffer and reproduce it anyplace you want. Even copy it into another picture.

Text can be placed anyplace on the picture in any of five different fonts just by clicking the text icon, clicking the font from a menu, and clicking the point where writing should begin. Hitting backspace erases letters and replaces them with whatever they were written over (one tends to use the phrase *without destroying the background* a lot in describing *MousePaint*).

The creation of lines and geometric shapes is facilitated by a process called rubber banding. Budge didn't invent rubber banding any more than *MacPaint* author Bill Atkinson did, but Budge has managed the most ambitious and impressive implementation of rubber banding on the Apple II to date.

You create a rectangle by clicking on the rectangle icon, moving the mouse pointer to one corner, holding the button down, and moving the mouse pointer to the location of the opposite corner. With rubber banding, the rectangle is drawn, erased, and redrawn until the mouse button is released. Circles and ovals are done the same way. You lay down the opposite corners of an invisible rectangle, and the computer creates the largest circle or oval that will fit within that shape, rubber banding it until the mouse button is released. This is really impressive when it's done with *filled* circles. Not only is the outline of the circle drawn and redrawn, but the pattern or color used for filling is as well. And the background isn't changed until the mouse button is released, so you can stretch the circle to a really big size and then shrink it. The drawing underneath will still be there when you come back. In fact, the background actually is intact beneath the shape even after you set it down "permanently"; if your very next move is to click undo from the edit menu, the shape disappears.

Art for Art's Sake. Equally impressive is Budge's implementation of Mac-like overlapping windows and menus. Three information windows are available in *MousePaint*. One allows the selection of brush shapes and sizes for the paintbrush tool. Because part of the screen is occupied with menu bars, tools, and paint patterns, the working area is actually a viewport into part of the page, which is the full size and dimensions of the hi-res screen; so the second window shows in miniature what the whole picture looks like. The third window is called *About MousePaint*, and it credits Budge as the author and gives credit for inspiration to Atkinson and *MacPaint*. Any of these three windows can be overlapped, moved, brought from behind another to the front, or closed and put away. The background always comes back perfectly.

The menus also work just like Mac and Lisa menus. A bar at the top

A MOUSE FOR THE REST OF US

BY DAVID DURKEE


File Edit Pics Fonts
Fatbits
Show Page
Set Brush
Grid
kpic
It's Neat!
AMDEK Color-I

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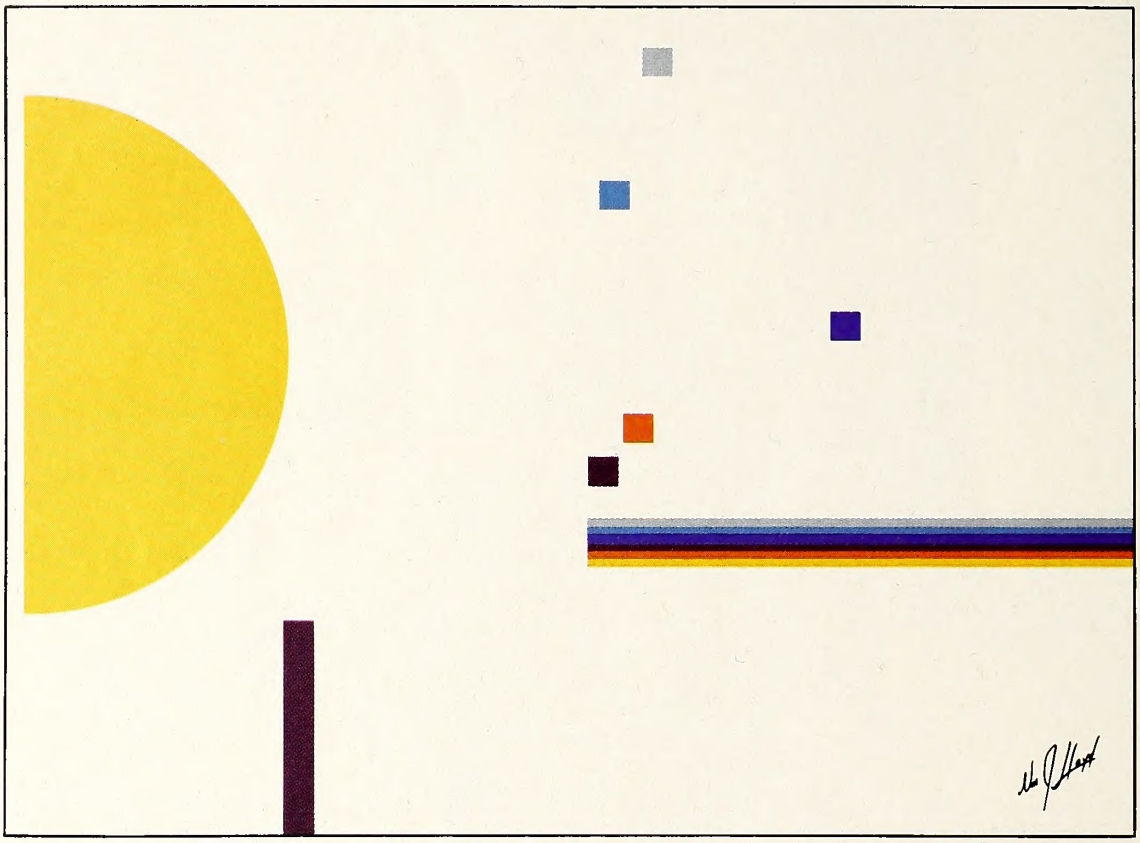

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abc

of the screen lists the names of all the available menus—*MousePaint*'s are File, Edit, Aids, and Font—and pressing the mouse button while pointing to any of them reveals the list of options in that menu. The menu remains on the screen, overlapping the picture and any other open windows, until the button is released. If the pointer is indicating any of the options on the menu when it is released, that function is executed.

Not all of the Apple II programs that are eventually written for the mouse will follow Macintosh conventions so closely. For many applications, it isn't necessary. Nevertheless, *MousePaint* shows that the Apple II is still capable of benefiting from all those oft-cited hours that went into the development of Lisa Technology. It also shows that Bill Budge retains the right to walk among the graphics gods of computer programming.

Budge has other plans for the AppleMouse II besides *MousePaint*. He's working on a graphics toolkit that will take advantage of the mouse. The toolkit will be based on QuickDraw, the set of routines in the Macintosh ROM that provides the graphics functions for everything on the Mac. The toolkit will provide routines for assembly language programmers to do most of the things that *MousePaint* does: polygons, circles, patterns, bit maps, proportionally spaced type fonts, and so on. Another part of the toolkit is a desktop manager, which can be used to manage folders, icons, and pull-down menus. Together, these routines will allow programmers to make Apple II behave like a Macintosh. Budge is also working on mouse-based font and brush and pattern editors to be used in conjunction with *MousePaint*. And he'll be updating his *Pinball Construction Set*, which used Lisa-like icons before Lisa was even available, to use the mouse as well.

Other developers with mice in their future include Penguin Software, Electronic Arts, and Quark Engineering. Penguin's Dave Albert says that future revisions of *The Graphics Magician* and *The Complete Graphics System* will include mouse drivers, as will the upcoming *Cat Graphics*, a set of ampersand graphics utilities. Tim Gill, president of Quark, reports that *Catalyst IIe* will use but not require the mouse. *Catalyst IIe* is a version of *Catalyst* moved down from the Apple III to run under ProDOS. The program allows for a library of application programs to be moved onto a hard disk and run from a user-designed menu. Gill also is considering a revision of *Word Juggler IIe* to use the mouse. In addition to *Pinball Construction Set*, Electronic Arts's *Cut and Paste* and *Financial Cookbook* will be able to read mouse input.

The Technical Considerations. The mouse is connected to the Apple II through an interface card that can go in any unoccupied slot from one to seven. The interface card carries a 6520 processor and eight routines in firmware that make the mouse a good deal faster and more responsive than a joystick. The card can be programmed to interrupt the Apple either every sixtieth of a second or to report certain events—movement of the mouse or a click on the button.

There is also a passive mode, in which the mouse is read only when the currently running program asks for it, the way a program reads a joystick. The advantage of the mouse's ability to interrupt the computer is that when something happens, the program won't miss it because it wasn't looking. But the program doesn't have to waste any time looking at the mouse to see if anything is happening. This feature will make the mouse attractive to machine language programmers, which will eventually translate into lots of software for the mouse.

The mouse can also be read from Basic by doing an in# to its slot and an input statement. The mouse tells the program its coordinate location and the status of the mouse button. As an added bonus, it also reports whether a key has been pressed, so a Basic program can take all its major input through the mouse input command.

The AppleMouse Barometer. There is still some speculation about whether the mouse is the wave of the future or just a trendy gimmick. The ultimate success or failure of Lisa Technology will tell us, in general, whether the computing world needs mice. How the mouse does on the Apple II will probably prove a far more specific indication of its strengths and weaknesses.

The mouse is likely to be good for some things and not as good for others. There is a huge body of software for the Apple II that is incompatible with a mouse. All other things being equal, the areas where new mouse-based software provides stiff competition for existing programs will be the areas where a mouse is really beneficial. Because everything on the Macintosh and the Lisa is mouse-dependent, those computers will never answer these questions. The Apple II will. ■

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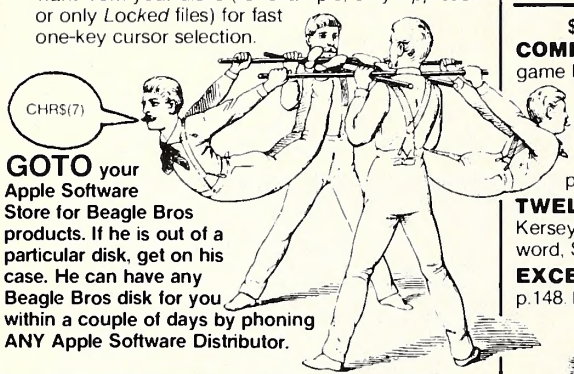

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RENAME DOS COMMANDS & Error Messages—"Catalog" can be "Cat"; "Syntax Error" can be "Oops" or almost *anything* you want it to be.

PROTECT YOUR PROGRAMS. An unauthorized Save-attempt can produce a "Not Copyable" message, or *any* message you want. Also easy List-Prevention and other useful Apple tips and tricks. Plus one-key program-execution from catalog.

CUSTOMIZE DOS. Change the catalog Disk Volume heading to your message or title. Omit or alter catalog file codes. Fascinating documentation, tips and educational Apple experiments.

ANYONE USING YOUR DISKS (booted or not) will be using DOS the way YOU designed it.

```
10 LIST: LIST: LIST: FOR ZZ=PEEK(175)+PEEK
(176)*256+36 TO 3072: POKE ZZ,216: NEXT
20 FOR XXX=1 TO 2: POKE-16299,0: POKE
-16300,0: XXX=1: NEXT: REM Experiment
with different length variable names.
```

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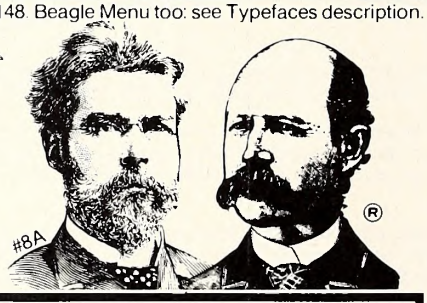
TWELVE GAMES from the Applesoft Ace, Bert Kersey— TextTrain, Wowzo, Magic Pack, Buzzword, Slippery Digits, and many many more...

EXCELLENT REVIEWS—See Jan-83 *Softalk*, p.148. Beagle Menu too: see Typefaces description.



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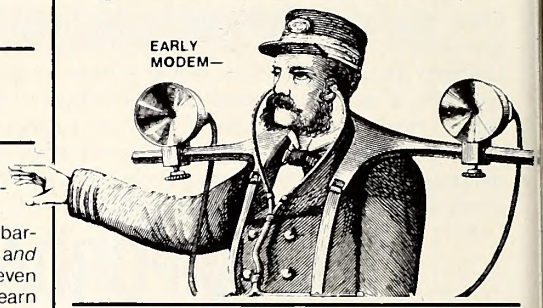
COMMAND CHART INCLUDED: Free with each Tip Disk; an 11 x 17 poster of all Applesoft, Integer Basic & DOS Commands with Descriptions!



FLEX TYPE

(FORMERLY "FLEX TEXT")
VARIABLE-WIDTH HI-RES TEXT UTILITY
by MARK SIMONSEN

$29.50: Includes Peeks & Pokes Chart

PRINT VARIABLE-WIDTH TEXT on both hi-res screens with normal Applesoft commands (including HTAB 1-70). Normal, expanded & compressed text with no extra hardware. (70-column text requires a monochrome monitor, not a tv).

ADD GRAPHICS TO TEXT or add Text to hi-res graphics. Run your existing Applesoft programs under Flex Type control. Fast, easy to use, and Compatible with GPLE and Double-Take.

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by TOM WEISHAAR

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UNATTENDED SHOWS are optional, with each picture arranged and pre-programmed to display on the screen from 1 to 99 seconds. Custom **Text Screen Editor** lets you create black-and-white text "slides" and add type "live" from the keyboard during shows. Mail copies of presentations on disk to your friends and associates (or home to Mom!).

NEW!

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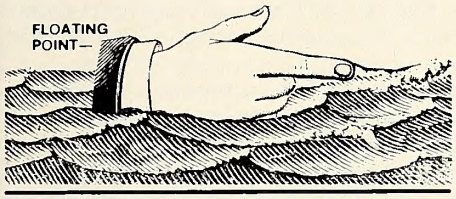
GLOBAL SEARCH & REPLACE: Find any word or variable in your programs, *FAST*. For example, find all lines containing a GOSUB, or edit or delete all lines with REM statements, or all occurrences of any variable. **Replace any variable**, word or character with any other. For example, change all X's to ABC's, or all "Horse" strings to "Cow".

80-COLUMN COMPATIBILITY: All edit & global features support **Apple IIe 80-column cards** and most 80-column cards on *any* Apple IIe, II+ or II.

DEFINABLE ESC FUNCTIONS: Define ESC plus any key to perform any task. For example, **ESC-1** can catalog drive 1, **ESC-L** can do a "HOME: LIST", **ESC-N** could type an entire subroutine... *Anything* you want, *whenever* you want.

GPLE DOS MOVER: Move DOS and GPLE to Language Card (or IIe upper 16K) for an EXTRA **10,000 Bytes** (10K) of programmable memory.

Plus APPLE TIP BOOK #7: Learn more about your Apple! Includes all new GPLE tips and tricks.



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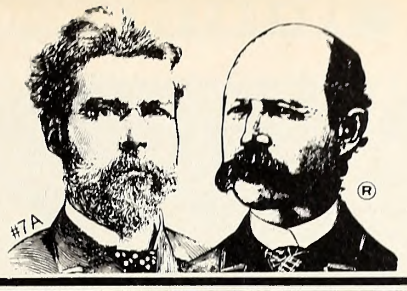
DRAW IN HI-RES on both Apple "pages" using easy keyboard commands OR paddles/joystick. Pre-view lines before plotting. Solid or mixed colors & Reverse (background-opposite) drawing. FAST one-keystroke circles, boxes & ellipses, filled or outlined. Add text for graphs & charts. All pix Save-able to disk, to be called from your Applesoft programs.

COMPRESS HI-RES DATA to 1/3 disk space (average) allowing more hi-res pictures per disk.

MANIPULATE IMAGES: Superimpose any two images, or RE-LOCATE any rectangular section of any drawing anywhere on either hi-res page.

HI-RES TYPE: Add text to your pictures with adjustable character-size and large-character color. Type *anywhere* with no Htab/Vtab limits. Type sideways too, for graphs. Includes Tip Book #4.



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BEAGLE BASIC

APPLESOFT ENHANCER
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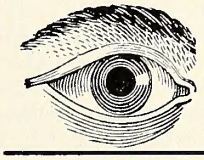
$34.95: Includes Peeks/Pokes Chart & Tip Book #6. Requires Apple IIe (OR II/II+ with RAM Card).

RENAME ANY APPLESOFT COMMAND or Error Message to anything you want. For program clarification, encryption/protection or even foreign translation. Plus add optional NEW COMMANDS:

ELSE follows If-Then statements, like this:
IF X=2 THEN PRINT "YES": *ELSE* PRINT "NO"

HSCRN reads color of any hi-res dot for collision testing. **SWAP X,Y** exchanges 2 variables' values. New **TONE** command writes music with no messy pokes & calls. **SCRL** scrolls text in *either* direction. **TXT2** lets Text Page 2 act exactly like Page 1.

PLUS: GOTO & GOSUB may precede variables, as in "GOSUB FIX" or "GOTO 4+X". Escape-mode indicated by special ESC CURSOR. Replace awkward Graphics screen-switch pokes with 1-word commands. Change ctrl-G Beep to any tone. **INVERSE REMS** too! All GPLE compatible.



```
1 FOR S=768 TO 773: READ A:
  POKE S,A: NEXT: POKE 232,0:
  POKE 233,3: DATA 1,0,4,0,5,0
2 HGR2: FOR R=0 TO 192: ROT=R:
  SCALE=96: XDRAW 1 AT 140,95:
  SCALE=30: XDRAW 1 AT 140,95:
  S=PEEK(49200): NEXT: RUN
```

PRONTO-DOS

HIGH-SPEED DOS / DOS-MOVE UTILITY
by TOM WEISHAAR

$29.50: Includes Peeks & Pokes Chart

TRIPLES THE SPEED of disk access and frees 10,000 bytes of extra memory by moving DOS.

Function	Normal	Pronto
BLOAD HI-RES IMAGE	10 sec.	3 sec.
LOAD 60-SECTOR PROGRAM	16 sec.	4 sec.
SAVE 60-SECTOR PROGRAM	24 sec.	9 sec.
BLOAD LANGUAGE CARD	13 sec.	4 sec.
(Text Files: No Change)		

Boot the Pronto disk or your updated disks, created with the normal INIT command. Compatible with all DOS Commands, GPLE, Double-Take, DOS Boss, DiskQuik and almost all unprotected programs.

MOVE DOS to your Language Card, RAM Card, or standard Apple IIe upper 16K, freeing up **10,000 EXTRA BYTES** of memory for your programs.

15 EXTRA SECTORS per disk. Catalog Free-Space displayed every time you catalog a disk.

TYPE-COMMAND ("TYPE filename") prints contents of sequential Text Files on screen or printer.

NEW!

DISKQUIK

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by HARRY BRUCE and GENE HITE

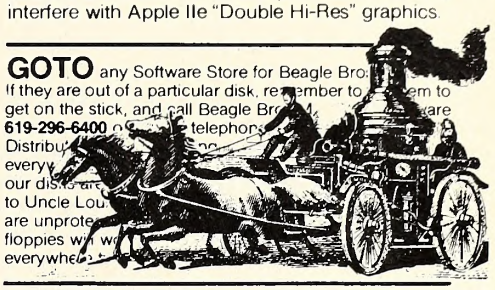
$29.50: Includes Peeks & Pokes Chart
Requires Apple IIe with Extended 80-column Card.

ACTS LIKE A DISK DRIVE in Slot 3, but much faster, quieter, more reliable and $350+ cheaper! Enjoy the benefits of a 2nd (or 3rd or 4th...) drive at less than 1/10th the price. Catalogs normally with "CATALOG, S3" command. Load & Save any kind of files into RAM with normal DOS commands.

SILENT AND FAST: Since no moving parts are involved, DiskQuik operates silently and at super-high speeds. See it to believe it. Your Apple IIe's Extended 80-column Card (required) can hold about half the amount of data as a 5¼" floppy disk!

MANY USES: For example, auto-load often-used files like FID etc., etc., into RAM when you boot up, so they are always available when you need them. Copy files from RAM onto disk and vice versa, just as if a disk drive were connected to slot #3.

FRIENDLY & COMPATIBLE with 80-column display, GPLE, ProntoDOS, and all normal Applesoft and DOS commands and procedures. Will not interfere with Apple IIe "Double Hi-Res" graphics.



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by MARK SIMONSEN

$34.95: Includes Peeks/Pokes AND Tips/Tricks Charts.

2-WAY SCROLLING: Listings & Catalogs scroll Up AND Down, making file names and program lines much easier to access. Change the Catalog or List scroll-direction at will, with Apple's Arrow keys.

80-COLUMN COMPATIBLE: All features support IIe and most other 80-column cards.

BETTER LIST FORMAT: Each program statement lists on a new line for *FAST* program tracing & de-bugging. Printer-compatible, any column-width.

VARIABLE-DISPLAY: Displays all of a program's strings and variables with current values.

CROSS-REFERENCE: Sorts and displays line numbers where each variable & string appears.

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Buttonwood Apples

BY KEN LANDIS

Dow Theory Explained, *Winning on Wall Street*

In this month's tutorial section, we'll explore Dow Theory, the oldest form of technical analysis on "the Street."

Dow Theory is the brainchild of Charles H. Dow (of Dow Jones fame), who popularized his ideas in a series of *Wall Street Journal* editorials published between 1900 and 1902. Dow reasoned that investors could better use stock prices as indicators of overall business conditions in order to forecast stock prices, rather than using the prices of the stocks themselves for forecasting. Dow's thinking is easy to follow: If a business is flourishing, its profits should increase; this, in turn, should increase dividends and thus the price of stock.

Charles Dow's successor, William Peter Hamilton, further developed Dow's basic principles, publishing them in the book *The Stock Market Barometer* in 1921. Then in 1932, Robert Rhea's *Dow Theory*, a more formal and complete account of the theory, appeared. Many of the technical analysis techniques in use today are derived from Dow Theory; it is truly the granddaddy of them all.

Dow Theory attempts to identify changes in the primary movements of the market. Once the Dow theorist has identified a trend, he follows it until it reverses. The theory is concerned with the direction of trends, not with their magnitude or duration.

Dow Theory assumes that the majority of the stocks in the market follow an underlying trend or pattern most of the time. Charles Dow constructed two indexes, the industrial index (which originally contained twelve issues and now has thirty) and the rail index (which originally contained twelve railroad stocks but now includes other forms of transportation stocks and is called the transportation index) to measure this underlying pattern.

According to Dow Theory, in order to analyze a stock you must know the daily closing prices of these two averages and the total number of transactions on the New York Stock Exchange. It's assumed that the daily changes in the closing prices of securities reflect the judgment and emotions of the participants with regard to the market as a whole. If we agree that the stock market is indeed an "auction" market—one in which all participants have the same information and the same chance to bid on a security—then we can assume under Dow Theory (or any other theory, for that matter) that the Dow Jones thirty industrials average and the Dow Jones transportations index reflect the expectations of the market. Thus, these indexes can be considered to represent the emotional index, forecasts, and expectations of the market and of the business sector as a whole.

Dow Theory's second major assumption is that there are three simultaneous movements in the stock market: primary movements, secondary reactions, and minor movements.

Primary movements are overall general market trends, such as a rising market (a bull market) or a falling market (a bear market). Either of these market conditions can last anywhere from several months to several years.

Secondary reactions are major changes within a long-term primary movement, such as a substantial rally within a bear market or a large decline within a bull market. According to Dow Theory author Rhea, a secondary reaction usually lasts anywhere from three weeks to three months; its magnitude will be from 33 to 66 percent of the primary price change since the preceding secondary reaction. Some latter-day Dow theorists believe that a secondary reaction can go as high as 100 percent of the previous primary price movement, but many feel that the move will normally fall within the 45 to 70 percent range.

For a Dow theorist, being able to distinguish between a new primary movement and a secondary reaction within a primary movement is crucial. Unfortunately, it's easy to misjudge the behavior of the market in this regard.

The lifespan of a *minor movement* may be as brief as a few hours or as long as three to four weeks. The minor movements are considered part and parcel of the primary or secondary movements themselves; because short-term market changes can be extremely deceiving, Dow theorists have a tendency to discount minor movements.

Once he's identified the primary, secondary, and to a much lesser extent the minor movements in the market, the Dow theorist is ready to begin assessing the market's long-term prospects. According to Rhea, if both averages stay within approximately 5 percent of their mean average for a period of two weeks or longer, the market is either accumulating (stock is being bought by expert investors who are bullish) or distributing (stock is being bought by potential speculators or odd-lotters who are bearish). Dow Theory says that if the two averages go above the 5 percent mark, then the market should rise also. If the two averages go below the 5 percent mark, then Dow Theory predicts that the market will fall.

Like many forms of analysis, Dow Theory uses volume movements to validate price movements. From a historical perspective, volume expands when the market is bullish and rising, and contracts when the market is bearish and falling. If the opposite of what's expected occurs at any point in a primary or secondary movement, the Dow Theory signal says that the trend may soon reverse.

In traditional Dow Theory, the only indication of trend reversal is a change in the price of the indexes themselves. If the market rallies and then falls, but does not fall below the highest price of the preceding rally, a Dow theorist interprets this as a bullish signal. Bearish signals are just the opposite—if the market is falling and its occasional rallies don't break through the bottom of an earlier decline, the Dow interpretation would be bearish.

But how does a Dow theorist tell when the market is turning either bullish or bearish? Well, according to strict Dow Theory, if the market is rising and the trough of the last rally is above the trough of the preceding rally, the market is considered bullish. If the market is falling and the high point of a rally is below the trough of the last fall, then the market is considered bearish. The Dow theorist considers still other indicators to be important: the movements must have been at least one-third of the primary movement, and the secondary movement should have had a life of at least three to four weeks. As always, volume information is valued as a source of other vital clues.

The most important "rule" in Dow Theory is the correlation between the industrials average and the transportation average. For any Dow Theory analysis to be correct, the averages must have a 100 percent correlation; that is, they must either both be going up or both be coming

down. The fundamental reasoning here is simple: If the market is a perfect barometer of business activity, then an increase in industrial activity (manufacturing) should stimulate a commensurate increase in the industries that move raw materials and finished products (namely, the transportations).

The market has probably been right as often as it has been wrong when used to predict overall economic or business activity, just as many of its prophets (the analysts) have. One valid criticism of Dow Theory is that it's often late in predicting rises or falls in the economy. Dow theorists have two ways of compensating for this weakness. They can use the earnings estimates of the major analysts to gauge the fiscal health of market participants, or they can use dividend yields for the same purpose.

A corporation's dividends are declared by its board of directors. If these individuals are optimistic about the future of their business and have had a good quarter or year, they are likely to declare higher dividends (though they may do otherwise). And if things have not been going so well, a company's board of directors will usually decide to lower the dividend payout in order to conserve cash—but not always. Reasons for varying from the expected behavior normally have their roots in the executive group's natural survival instinct. Shareholders often become dissatisfied when dividends fall, and in order to keep investors happy, a company's board of directors may decide to pay higher dividends than their own judgment of the market situation might dictate. By the same token, a company's decision makers might just decide to pay lesser dividends than it would appear they can afford.

Adherents to Dow Theory usually consider a fall in excess of 3 percent in the dividend yield of the Dow industrial average a sign that a bear market may be on the way. If the dividend yields rise above 6 percent, Dow theorists usually anticipate a bull market. These readings must be confirmed by other indicators, however; used alone, they can be misleading.

Other criticisms of Dow Theory stem from the effect government regulation has on industries, the imperfection of the market as an indicator of business activity, and the effects that outliers (companies that do not necessarily follow the overall trend) have on the indexes. Despite these criticisms, Dow Theory is still very much in use.

Winning on Wall Street: The Trader's Data Manager, Summa Software Corporation (Box 2046, Beaverton, OR 97075; 503-644-3212). $200.

Backup Policy: Copyable.

System Requirements: 48K Apple II Plus with 16K RAM card or Apple IIe, two disk drives, eighty-column printer.

Optional: Grappler Plus or compatible interface, D.C. Hayes Micromodem II.

Winning on Wall Street is an integrated stock market package that consists of three distinct modules: one for data management, another for forecasting, and a third for accounting. These modules are available separately or as a set and can be used either as standalone programs or as components of an integrated system.

In this month's review section, we'll focus on the data management module, *Trader's Data Manager*. We'll finish our look at *Winning on Wall Street* next month, when we consider *Trader's Forecaster* and *Trader's Accountant*.

Trader's Data Manager manages data, stores information for the forecasting system, and is capable of sharing information with the portfolio accounting system. In addition to its database capabilities, this program provides a variety of graphic analysis tools.

The *Data Manager* can be used to store and track corporate and foreign bonds, mutual funds, treasury notes, and equities. This flexible program can be used not only by individual investors but by stockbrokers, fund managers, and other investment professionals. Unlike investment-oriented programs that limit the type and amount of information that can be stored, *Trader's Data Manager* lets you define the information you want to store. It calls these pieces of information *attributes*. For each security, you're allowed to store up to eighteen attributes, each of which can have up to 1,000 data points. You can enter daily, monthly, quarterly, or yearly information.

This system can retrieve information directly from Dow Jones News/Retrieval, or it can work with information the investor has input at the keyboard.

Like the other *Winning on Wall Street* modules, *Trader's Data Manager* is menu-driven. From the main menu, the investor can create and modify stock files, enter stock data (via the keyboard), convert data, download from Dow Jones, generate data reports, and create data graphs. The first step is to create a data file for the security you wish to track. Creating this file is easy; you just supply the information the program asks for, such as the stock's code (ticker symbol) and the name of the security. Once you've entered the necessary data, you can begin defining what information about the security you want to store.

You're required to supply three characteristics for each piece of information to be stored: the attribute code, the conversion type, and the storage type. The attribute code signifies the name of the type of information you're going to store (such as high, low, or close). The conversion type determines what information the system will capture when you update your files. *Data Manager*'s conversion types are highest value, lowest value, closing value, total value, beginning value, and average value, each of which is entered by pressing the appropriate letter key. (In a traditional high, low, close volume setting, the conversion types you'd use would be H, L, C, and T respectively.)

The storage type determines the format of the numeric information for each attribute and conversion type. The program can handle stock price values expressed as integers, volume information expressed in lots of 100, floating point values expressed as decimals, and integer values. If you intend to download from Dow Jones, you must make sure not only that a security's attributes, conversion, and storage types correspond to Dow Jones, but also that they match the information you want to capture.

The investor can also define what the program calls relational attributes. Computed using information captured in other attributes, a relational attribute may be either the ratio of two attributes to each other or the difference between the two attributes. For example, if you were interested in knowing the overall range of a security's price movements over a trading day, you could define a relational attribute that took the security's high price and subtracted its low price from that figure. The result would be placed in the relational attribute and used in any of the reports or graphs you asked the program to produce. Once a security file has been defined, you can add or delete an attribute or an entire file as necessary using utilities that are built right into the program.

When you wish to enter data at the keyboard, the program entry screen requests the stock code (the name of the stock file), the starting date for the data entry, the time unit (daily, weekly, monthly), and a list of the attributes you'll be updating. To tell the program that you plan to update, just press return.

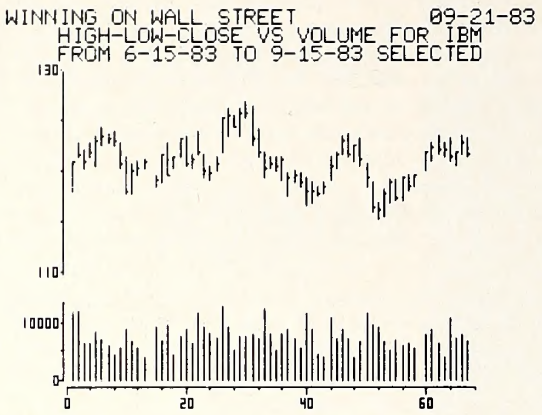
The structure of the program's manual entry is unique—the data entry module lets you choose what information you want to update, thus saving you from having to skip over data fields you may not be using any more—and it is exceptionally well done.

The program does not automatically save the data you've input to disk; instead, you must tell it to do so via a menu that appears when you leave the data entry screen. Your choices at this point are to continue data entry (returning to the same security), save the data, print it out to check it, or abort the session and return to the main menu. If you choose to save the data and there's not room on disk for all of it, an error message will appear and you'll need to insert a new disk. The amount of information you can store is determined by the number of attributes you use and by the time period of the information you wish to capture.

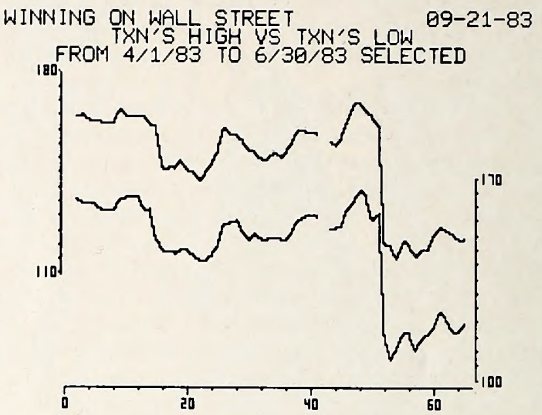
It's important to remember that no matter how you set up your database, you can't store more than 1,000 data points per attribute. Another point to consider when you're setting up your stock files: *Trader's Data Manager* can only analyze securities that reside on the same disk; you can't print out a report or chart on two different securities that reside on two different disks. While the vast majority of investors won't find this a problem, some investors—specifically those who do both inter- and intra-industry analysis—may find that they have to copy some data files from one disk to another. This is easy to do using the program included in the *Data Manager*.

If you plan to use Dow Jones News/Retrieval to update your security files, you'll need to include the stock exchange codes required by Dow Jones in the stock codes and the Dow Jones symbolic annotations in the security codes. You'll find these in the Dow Jones documentation, as well as in *The Trader's Data Manager* manual.

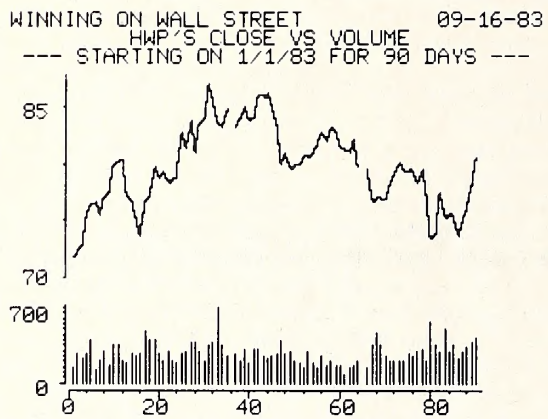
The program connects you to Dow Jones automatically, using the information you supplied when you configured the system. Once connected, you'll be prompted for the security code and the starting and ending dates for which you want to retrieve information. Unfortunately, you



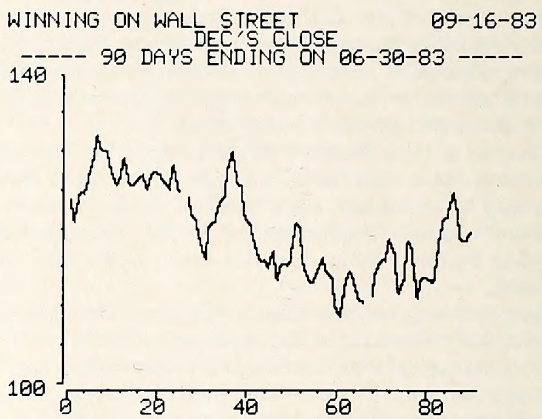
High/Low/Close vs Volume Graph.



Attribute Comparison Graph.



Attribute vs Volume Graph.



Single Attribute Graph.

must repeat this process for each security you update. A setup procedure through which the investor could simply indicate which securities should be updated, and the relevant dates, would be a welcome addition to the program. Once the user had logged on, the needed information would be fetched automatically, eliminating the very real possibility of incurring connect time charges from Dow Jones when the system is idle. Also, if such a facility were implemented, the investor could be prompted to change disks when necessary to update files stored on disks other than the one currently in the drive.

Output from *Trader's Data Manager* takes two forms: reports that show the structure and content of the database, and graphic analysis of the information stored there. Let's look first at the reports.

The *stock data report* lists the attributes and their values for a given security. Up to three attributes can be displayed on-screen at the same time, and up to seven may be printed out. You control the attributes included in a report, the time period covered, and the time units employed. The program then goes through the security file and produces the report based on the user's specifications.

The *attribute comparison report* follows much the same procedure. The only difference in setting up this report is that rather than supply the attribute codes for the same security, you input the stock codes of different securities along with one attribute code. The report that results provides a comparison of the different securities selected in terms of that attribute. A report showing the closing prices of Apple, IBM, and Compaq stock is an example of an attribute comparison report.

The *stock summary report* lists all the securities on the disk, along with their respective attribute codes, conversion types, and storage types. It illustrates the internal structure of the program's database and is used by the program as a roadmap for creating the other reports and graphs.

The graphic analysis portion of *Trader's Data Manager* consists of four types of graphs: high/low/close versus volume graphs, attribute versus volume graphs, attribute comparison graphs, and single-attribute graphs. Examples of each type appear in the accompanying figure.

Any of the four graph types may be further analyzed or manipulated using the commands that appear at the bottom of the screen. This is done by activating a vertical cursor called a wand. The wand is moved over the graph using the left and right arrow keys. Placing the wand over a data point displays the underlying data values on-screen. Horizontal lines (representing thresholds, averages, or whatever) and the vertical scale of the graph may be changed to suit your needs or taste. To erase all the lines that have been constructed on the graph so you can begin a new analysis, simply press E for erase.

The other two commands available are used for printing out data values or plotting the graph. Data values can be printed on almost any type of printer, while the graph can only be printed on a printer that's compatible with the Grappler interface or that has a grappler-compatible interface card.

The data conversion program is used for maintenance reasons (file cleanup) or for changing the presentation of reports. This program converts daily security information into weekly, monthly, quarterly, or yearly information, based on the amount of information available. The investor may delete or save the daily information once the conversions are done.

Because of this program's one-disk orientation, it can be difficult to track files stored on different disks. It's not always easy to remember what stock is where, when it was last updated, and what information about it is stored where. A minidatabase that kept track of these facts and produced a consolidated report on all the stock files would be a valuable enhancement to the program.

The real strength of this program is not readily apparent. Its reporting and charting capabilities are very strong, but the package is really designed for use with the other two *Winning on Wall Street* modules, which we'll evaluate next time. Nonetheless, on a standalone basis, *Trader's Data Manager* meets or exceeds the error-checking, ease-of-use, and performance standards we've set forth in previous columns. ■

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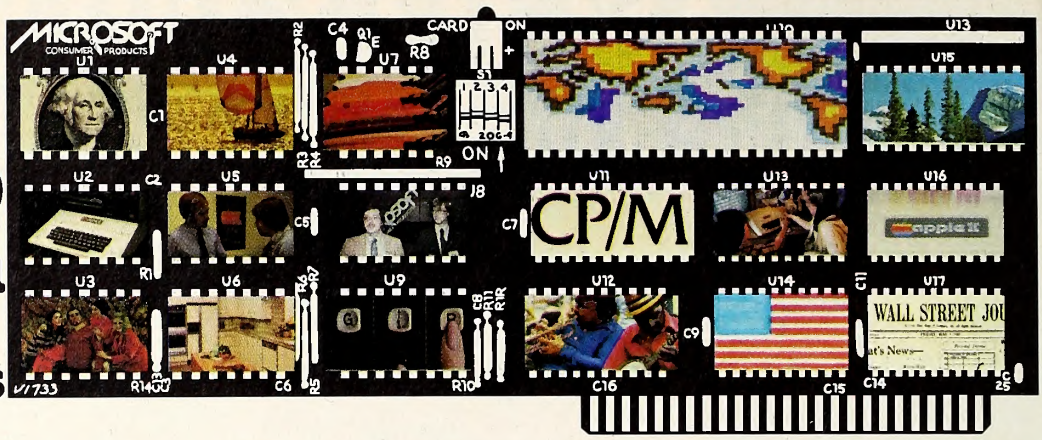
SOFTCARD Symposium

by Greg Tibbetts



Welcome to SoftCard Symposium for the month of March. We're still in the process of discussing the BDOS disk I/O functions. The remaining functions to be dealt with are those related to the handling of disk files. Before we look at those functions, however, we're going to take a short break. While we've spent considerable time in past columns discussing disk I/O, we haven't presented a thorough examination of disk file structure. Our goal this month, therefore, will be to present the most complete picture we can of this somewhat complex topic. We will wait until next time to discuss the remaining BDOS functions and to update our subroutine library.

A disk file is a relatively simple concept—nothing more than a series of disk sectors containing related data. Unfortunately, like most things in life, disk files become more complex as you move from concept to practice. In practice, the disk operating system that controls and accesses the files must construct every file in such a way that all the various actions a user might wish to perform can be accomplished safely and with relative ease and speed.

For the disk operating system to perform in this manner, a disk file's content and structure must be rigorously controlled. In addition, the system must have considerable information on each file it creates or accesses so that it can keep very close track of the files' current status and condition. Finally, the system must require any program that is to be used for accessing files to supply specific information in a known format—a specific protocol—so that access is allowed only when certain conditions have been met. This is where the complexity is introduced.

In CP/M, all files have the same low-level structure; that is to say, all files are collections of logical disk sectors, with each sector containing 128 bytes worth of values ranging from 0 to 255. As a result, BDOS can treat all files the same, regardless of the type of operation the user wishes to perform. This does not run contradictory to the fact that files may be of different kinds (random, sequential, transient command, and so on). Rather, different kinds of files can be said to have a different high-level structure; that is, the organization of the data elements they contain differs. This difference between low- and high-level structure is an important concept.

Low-level structure deals with the actual storage of data on the disk media and is the responsibility of the operating system (BDOS), while high-level structure deals with the specific byte-value content of the file and is the responsibility of the utility or applications program (Basic, *WordStar*, and so on). Never is the operating system concerned with the contents of a file, nor does the applications program care how the file is stored on disk. Each leaves the other's area alone.

Some of you will be quick to point out the existence of both random and sequential access functions within BDOS. This would seem to indicate two types of disk files from BDOS's standpoint. The difference, however, is simply in the method used to obtain or store data within files—there might not be any difference in the files themselves. Identical files can be created with both access methods, allowing randomly created files to be accessed sequentially, and vice versa.

There are one or two cases where individual differences can occur, the primary one being unallocated "holes" in the middle of random files. These differences are a result of the rules governing each access method, however, and do not concern the general file structure. The important thing to remember is that BDOS treats all files the same, altering only the method of access as specified by the programmer.

Since operating systems and applications programs do not involve themselves in each other's areas, there must be some common ground on the basis of which the two can communicate. This shared protocol, alluded to earlier, takes the form of a data structure that must be used and altered by both entities during disk file operations. The data structure is called the *file control block*, or FCB. An FCB must be presented by the applications program any time a file (or group of files) is referenced. An example of the FCB data structure is shown in the accompanying figure. We will refer to it throughout this discussion.

At first glance, this figure should look familiar to those of you who've been readers of this column for a while. In the July 1983 column, we discussed the arrangement of the disk directory-entry data structure; and the file control block and the directory entry are nearly identical. There is good reason for this, since the directory entry for a file is actually a modified version of the FCB used to create it.

The first FCB field is DR—identified in the chart as the drive number of the drive containing the file. Its true name is *drive specification*, and it is the means by which the program informs BDOS of the system drive to access. Although you're not communicating with BDOS when you type at the keyboard or read the screen, you have used and seen the drive specification often. During filename entry and display using the CCP or utility programs, the drive specification always precedes the filename and filetype.

In these cases, the drive specification is some alphabetic character from A through P that represents one of the sixteen possible drives in a CP/M system. Since only six drives are allowed in SoftCard CP/M, only the letters A through F are recognized as valid when SoftCard is used. The alphabetic drive specifications you have used in the past have always

Byte	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Use	DR	N1	N2	N3	N4	N5	N6	N7	N8	T1	T2	T3	EX	S1	DM	RC

Byte	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Use	BA	BB	BC	BD	BE	BF	BG	BH	BI	BJ	BK	BL	BM	BN	BO	BP

Byte	32	33	34	35
Use	CR	RL	RM	RH

Field	Purpose
DR	Drive number on which the file is to be found, which may range from zero to sixteen.
N1–N8	Filename consisting of eight characters.
T1–T3	Filetype consisting of three characters.
EX	The extent number being referenced.
S1	The unfilled bytes field (used internally by BDOS).
DM	The data module number being referenced.
RC	The record count for this extent.
BA–BP	Sixteen bytes of disk block numbers actually occupied by this file.
CR	One-byte current record number addressed in a sequential file operation.
RL–RH	Three-byte current record number addressed in a random file operation.

File control block.

consisted of two characters—the drive letter and a colon (:). The colon is used as a delimiter (separator) to signify that the character preceding it is a drive and not the first character of the filename.

Since we called it a drive *number* in our figure, you might suspect that the drive specification is not used by BDOS in exactly the same way as it is input to or displayed by the CCP or by utility programs. You would be right. Since the FCB is structured in a rigid manner, and since the drive specification must always be the first byte, BDOS has no need of the colon/delimiter to separate the drive specification from the filename. Further, BDOS does not use the drive specification in its ASCII form. The drive specification that BDOS requires is a number in the range 0 through 16 (0 through 6 in SoftCard CP/M).

In either case (6 or 16), the range of numbers allowed is one more than the number of drives allowed. The difference here is the possible drive specification of 0. Numbers 1 through 6 represent drives A through F, with A being 1, B being 2, and so on. When a 0 is placed in the DR field, the program is informing BDOS that the drive to use is the currently logged drive and that file access can start immediately using the drive number BDOS keeps internally. When any other number is used, a disk select function is automatically done on that drive by BDOS, the requested operation is performed, and the old, currently logged drive is reselected. This process is known as *auto drive select*.

Obviously, then, there are two ways to access a disk. One way is to select the correct disk using the BDOS disk select function and then to access the file with an FCB drive specification of 0. The alternate method—one that saves you considerable space in your programs and in the time spent writing them—is to leave the currently logged drive selected and use the drive number containing the file in the FCB. This auto drive select is considerably easier to use than the other method we mentioned.

Now we can point out the first difference between the FCB and the directory entry. The directory entry field corresponding to DR does not represent a drive number. Obviously, since floppy disks may be placed in any drive, keeping such information would be pointless. Instead, this field in the directory entry is either an 0E5H byte, meaning that this thirty-two-byte entry is vacant, or it is some number from 0 to 15 and represents the user number in which the file is contained. Remember that each disk directory can have files in any of sixteen different user areas.

The next two fields of the FCB are shown as F1 through F8 and T1 through T3. Together, these two fields are called the *file reference*. The file reference is the means by which BDOS identifies a specific file on the indicated disk. File references can either be unambiguous, meaning that they refer to one and only one specific file, or ambiguous, meaning that they reference all files in a particular group. Since the two types of file reference are so similar, we'll examine unambiguous references first and then discuss how ambiguous references differ from them.

A file reference is actually made up of two distinct parts: the *primary filename* (or simply filename) and the *filetype* (sometimes called the extension). The arrangement is always filename (F1–F8) first, followed by filetype (T1–T3). If it helps, you may want to think of the filetype as a group identifier and the filename as a specific identifier. There even exists a sort of arbitrary grouping wherein specific filetypes usually indicate particular kinds of files—COM is used to indicate transient command files, BAS to indicate Basic files, and so on. These groupings, however, are for the convenience of humans and have nothing to do with how BDOS internally views the files. With the exception of COM, they are not universally in use, so it's unwise to rely completely on this method of grouping in every situation.

Contrary to what you may have seen in using CP/M, BDOS always requires that the primary filename be eight characters long and that the filetype be three characters long. The figure shows this to be true, since there are precisely that number of character positions that must be used. Most programs that access BDOS (including the CCP and CP/M utilities) do not require you to make your file references match this "eight and three" format and fill in unused character positions with spaces. For convenience, these programs automatically place spaces in any unused positions.

To accomplish this, however, a program must be able to examine the input of the person using it and know where the filename stops and the file type starts. This is accomplished in CP/M via another delimiter, the period (.). The following examples show how a person might type several file references for a program, and how that program would alter them before transmitting them to BDOS. For clarity, spaces are shown as underlines.

File Reference	BDOS Receives
ZAP.COM	ZAP_____COM
THISFILE.TXT	THISFILETXT
AFILE	AFILE_____
ACCOUNT.1	ACCOUNT__1__

Since using the disk functions means that we're communicating directly with BDOS, we must begin to view the file reference and other file information as BDOS needs to see it. As we proceed, what BDOS needs to see will be pointed out and contrasted with the familiar format.

As our recent examples indicate, the period is not used at all by BDOS and must not be included in any file reference given to it. Irrespective of all our talk of filenames and filetypes, it is apparent from the figure and the examples that BDOS simply uses an eleven-character file reference internally and does not differentiate between filename and filetype. The eleven characters may be any members of the printable ASCII character set, with the exception of the following reserved characters:

< > . , ; : = ? * [ ] _ % ¦ / ↵

All of what we have learned so far about unambiguous file references applies to the ambiguous ones as well. In addition to the characters allowed in unambiguous references, however, two additional characters are allowed in ambiguous ones when communicating with the CCP and programs: the question mark (?) and the asterisk (*). Only the question mark is used when dealing directly with BDOS, as we will be doing. The asterisk is simply translated by the CCP or program into a series of question marks for BDOS. When the CCP, for example, receives the file reference ACC*.DAT, it translates that into ACC?????.DAT before communicating with BDOS. When asterisks are used, they must be the last character in the filename or filetype field.

The question mark is used by BDOS as a wildcard character. Such a character in a file-reference position will match any character in the corresponding position within a directory entry filename or filetype. This makes it possible for the user to identify all the COM files in a disk directory using the file reference ????????COM or all the ACCOUNTx.DAT files (x being any character) using ACCOUNT?DAT. The wildcard feature is most often used when one is searching the disk directory for a given set of files. The file reference ?????????? will match with any filename allowed in CP/M. When a file reference match is made in the disk directory and an open file operation is peformed, BDOS copies the correct characters from the directory to the FCB.

Ordinarily, all the characters used in an FCB file reference will have their parity bits reset (bit 7 equals to 0). In two cases, however, the parity bit becomes a flag to indicate certain attributes of the file being referenced. These two cases are the first and second filetype characters, T1 and T2.

The T1 position is used to indicate either read-write (R/W) or read-only (R/O) status for a file. Last month, we saw that an entire disk can be set to R/O status by BDOS to prevent any writes on that disk. This same approach can also be used when dealing with individual files, and BDOS will reject any attempts to erase, rename, or write on any such file. Using the STAT.COM program (or one of the disk functions we'll be examining), any file may be changed to R/O or R/W status on a semipermanent basis. In such a case, the actual directory entry on the disk is altered to reflect this new condition. The condition remains in effect until it is altered again using STAT. To make a file R/O, the parity bit of the first filetype character is set (made equal to one). To make it R/W again, the parity bit is reset.

The parity bit of the second filetype character is used to reflect the DIR/SYS attribute. Files are either directory (DIR) files or system (SYS) files, with DIR being the default condition. Giving a file SYS status means that it will not be displayed on the screen during directory listings and that PIP (and many other utilities) won't access the file without special instructions. By and large, the file is still available through the CCP for its built-in commands (ERA and so on), and if it is a COM file it can still be executed, but most utilities will simply not see it. The alternate DIR status means that the file is always displayed during directory listings, may be copied by PIP, and is visible to most utilities. A file is made SYS by setting the parity bit of the T2 position; it is made DIR by

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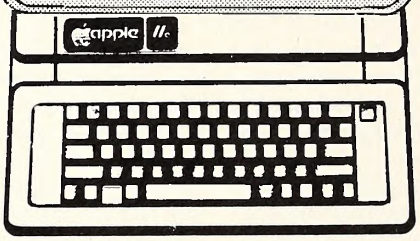

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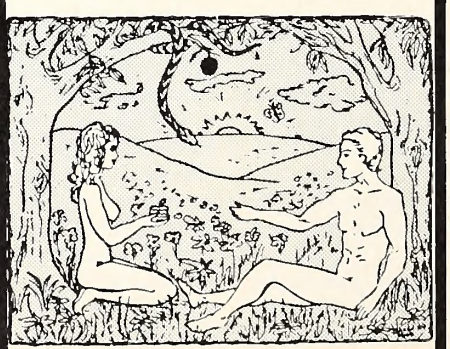

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resetting the parity bit in that position.

There is no attribute association for the third filetype position (T3) or for any of the filename positions (F1–F8). Digital Research originally reserved the F5 through F8 and the T3 parity bits for possible future attribute definitions of their own. The first four (F1–F4) were left for the user to define, if desired, and are not used in any way by BDOS. Since CP/M 2.2 has now been replaced by Digital Research with CP/M Plus (CP/M 3.*x*),it is unlikely that 2.2 will be updated to define uses for these bits.

Irrespective of this, we've seen that there is always a three-character filetype regardless of whether or not the programmer or user specified any characters for it when the file was created—the filetype being three spaces as a default. Since the filetype always exists, the file attribute flags always exist as well, and this must be taken into account when manipulating files through BDOS system calls. If you wish to access both SYS and DIR files, for example, always set the parity bit in byte 2 of the filetype. Similarly, be sure to check for the presence of R/O files when writing to disk, so that you do not mistake the type of error received should your program attempt to write to such a file.

The next field, EX, is the extent field. As we saw in our discussions of the directory entry last July, all files are divided into some number of 16K extents. (Since most files are less than 16K, this number is usually only one.) The EX field specifies which extent of the file the programmer wishes BDOS to access. The values it contains range from 0 to 31, the highest possible extent number.

In a way, extents themselves are like individual files. Each has its own directory entry on the disk. Whenever a specific extent of a file is being accessed, the FCB must show that particular extent number. Extents must be opened before they can be accessed. Although we'll be discussing the open operation in detail next month, we'll say for now that it is the process of informing BDOS of the extent to be accessed, allowing BDOS to validate the FCB by verifying that the extent exists and then filling in any information needed from the disk directory. This will become more important as we examine the disk functions next month.

The S1 field that follows EX contains a value that BDOS uses internally. This value is never accessed by the programmer, and seldom even by BDOS. For this reason, we'll ignore it.

The next field, DM, is the data module number of the file that BDOS is to access. The data module, like the extent, is another unit of file space—in this case 512K. Since a data module is made up of thirty-two 16K extents, there can be only sixteen data modules in the largest file that BDOS can access (eight megabytes). Therefore, the value of DM may range from 0 to 15. For our purposes in SoftCard CP/M, this field will always be 0. Out of safety considerations, this field should be specifically set to 0 by your program before disk functions are requested, even though BDOS does so automatically during some of them. If this is not done, you may get inaccurate results.

The next field is RC, short for record count. Just as in the directory entry, this field is the total number of records contained in this extent. Since an extent is 16K maximum, and since records are 128 bytes long, up to 128 records may be contained in the extent. This value therefore will range from 0 (for an empty extent) to 128 (for a full one). It will be copies from the directory entry to the FCB during any open operation and will be updated during file writes as new records are added.

The last four fields we've discussed (EX, S1, DM, and RC) should be set to 0 during the creation of any FCB. While this is not specifically required in all cases, it is the safest way. For the most part, the remainder of the FCB (bytes 16 through 35) can be left containing any value without fear of trouble. One or two exceptions to this rule of thumb exist, and we will point these out when we come to the functions in question.

The field following RC is sixteen bytes long and shown as BA through BP. Its actual name is the *block list*. This field lists the disk blocks that have been allocated to this extent of the file. During our many past discussions, we have seen that CP/M disks are divided into 1, 2, 4, 8, or 16K blocks—the actual block size being chosen by the BIOS designer—and that SoftCard disks have a block size of 1K. The block list, therefore, can list up to sixteen SoftCard block numbers.

Since blocks are numbered sequentially from the first sector of the directory to the last sector of the disk, BDOS can use these numbers to calculate track and sector. The block list is the means by which BDOS can locate actual records on the disk during file I/O. This field is filled in by BDOS from the disk directory when the first file access is made using the appropriate FCB (assuming, of course, that the file is found).

So far, the FCB and directory entry are practically identical. In fact, BDOS uses an FCB to copy directory entry information into and out of memory during some file operations, such as open file and close file. It is also apparent that the portion of the FCB presented so far is a sort of disk address for a portion of the file, showing which drive the file is on, the file reference and attributes, the file's extent, its data module, and the record count and data blocks occupied on disk for this extent.

Those first thirty-two bytes form a basic FCB. The programmer always supplies the DR, F1–F8, T1–T3, EX, and DM fields to inform BDOS of the specific drive, file (or group of files), data module, and extent requested. BDOS responds to the first function request (usually the open file function) by attempting to find the file in the directory. If successful, BDOS completes the FCB by filling in the RC and BA–BP fields from the directory entry. This is the process of opening a file (an extent).

The first thirty-two bytes are all that's really needed for the majority of operations—to make file, close file, open file, find file, and so on. The read and write operations, however, since they deal with specific records, require that BDOS be informed of the record requested. This is done using the CR and RL–RH fields.

The CR and RL–RH fields are used to access individual records from the file in sequential access mode and random access mode, respectively. These two terms, random and sequential, must be fully understood. *Sequential access* of a file is the reading or writing of file records one after another, usually from the beginning of the file. *Random access*, on the other hand, simply means to read or write file records in any sequence whatsoever.

The CR field is used for sequential access. It specifies the record number to be read or written from the current extent (the extent whose number appears in the EX field of the FCB). Since sequential access is normally performed starting with the beginning of the file, the CR field is usually set to 0 by the program just prior to the first read or write function call.

From that point on, BDOS takes care of incrementing CR after each successful read or write operation, and of moving to the next extent (finding the new extent in the directory and changing the EX, RC and BA–

BP fields) when CR exceeds the maximum record value for the previous extent. Note that RC is a count ranging from 1 to 128, while CR is a record number ranging from 0 to 127. Consequently, BDOS is able to tell that the highest record has already been read when it increments CR and finds that it has become equal to RC.

The process referred to a moment ago as "moving to the next extent" actually involves several separate operations. First, the current extent is closed (updating that extent's directory entry). Then the EX value is changed in the FCB and the new extent searched for. If it is found, the new extent is then opened (copying the new extent's information from the directory entry to the FCB). All these operations can be performed using the BDOS file functions. If the programmer chooses to control them all manually in this fashion, CR can be used to read and write the file in something similar to random access mode.

BDOS will, in fact, read or write any record number (CR) from any numbered extent (EX), provided that the FCB was activated with an open file or make file call using that extent number. It is easier, however, to use the RL-RH field and the random access mode for this purpose.

During random access, the programmer opens the file (or creates it) with EX set to 0. Then a random record number between 0 and 65535 is selected to be read or written. This is placed in the RL and RM positions. These stand for random record number low-order byte and random record number middle-order byte, respectively. The high-order byte (RH) is seldom used, since all record numbers allowed (0 through 65535) can be represented entirely in two bytes. BDOS does use RH during file size calculations, but it is never used during normal file I/O operations.

The two-byte random record number is stored in RL and RM, low byte first and high byte last. RH must be set to 0 and must remain 0, or an error will result. Once all this has been accomplished, the random read or write system call is selected, and BDOS then determines the proper extent to use, sets EX to that value, opens that extent, calculates the CR value within that extent that is equivalent to RL-RM and, finally, reads or writes the record.

Note that BDOS places the correct extent number and current sequential record number into the EX and CR fields before performing the read/write operation. Obviously, then, BDOS accesses all files using the EX and CR values and can be said to do all of its access sequentially, using RL-RH for calculation purposes only. Unlike normal sequential access, however, BDOS does not automatically increment RL-RH or the EX and CR fields if the operation is completed successfully. We'll elaborate next month when we get to the functions themselves.

This completes our discussion of the FCB's internal structure. There are, however, one or two more points to be made. First of all, the FCB can be anywhere in memory. This is because its address will be passed to BDOS during the function call in the [DE] register pair. Even so, there is a default area in memory for a single FCB. This area is in the system data page at location 005CH and extends for thirty-six bytes through location 005FH. The system and most CP/M utilities use this default FCB area for all file operations in the system. It is fairly well protected, and because of this many programmers use it in their own programs.

The default FCB area is also used by the CCP for setting up initial FCBs in response to commands typed at the console. For example, when using STAT to check the size of the file ACCOUNT.DAT in the default FCB area at 005CH. It would appear as follows in DDT format:

```
005C: 02 41 43 43 4F 55 4E 54 20 44 41 54 00 00 00 00 .ACCOUNT DAT....
006C: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
```

As you can see, all fields except DR and F1-T3 have been initialized to 0. (Note that if no drive specification had been typed, the DR field would also be 0 to indicate the currently logged drive). The FCB built by the CCP is sufficient to create, open, or search for the file, and it can be used as is for these purposes. It is up to the designer of the program (STAT or whatever) to supply any further information that may be needed for additional operations.

In certain cases, two files are entered at the console. One such case is the PIP command:

```
PIP B:ACCOUNT.BAK=A:ACCOUNT.DAT
```

In this event, the CCP creates the important parts of two FCBs in the default FCB area as follows:

```
005C: 02 41 43 43 4F 55 4E 54 20 42 41 4B 00 00 00 00 .ACCOUNT BAK....
006C: 01 41 43 43 4F 55 4E 54 20 44 41 54 00 00 00 00 .ACCOUNT DAT....
```

As you can see, the second FCB occupies the block list field of the first FCB. Because of this, the FCBs cannot be used as they are. The one exception is the rename operation, which will be identified when we discuss function 23 next month. For all other operations, the partial FCB at 006CH must be moved to some other area before file operations commence. The CCP's actions in creating FCBs from input can be handy when you're designing utility programs that act on other files.

One additional note: Besides creating the FCBs at the default location, the CCP places the number of characters and the actual characters themselves, typed by the user, in the default buffer at 0080H for access by your program if needed. Neither the count nor the input includes the transient command filename (PIP, for example), but they both include the space between the transient command and the files to be acted upon. For our recent example using PIP, there were twenty-eight characters typed. In that case, the CCP would leave the default buffer as follows:

```
0080: 1C 20 42 3A 41 43 43 4F 55 4E 54 2E 42 41 4B 3D . B:ACCOUNT.BAK=
0090: 41 3A 41 43 43 4F 55 4E 54 2E 44 41 54 00 00 00 A:ACCOUNT.DAT...
```

The 1CH value at 0080H is the number 28, representing the number of characters typed. Following that is a space (20H), which is the space typed by the user between the command (PIP) and the first character of the files to be operated on (B). Following the space are the remaining twenty-seven characters of user input. This facility of the CCP can be employed by your programs to capture and act on any user input following the transient-command name used to invoke your program. It is especially useful when you wish the user to enter input other than file references, since the CCP may not correctly copy such information into the default FCB.

This completes our discussion of file structure and the data elements used when programs communicate with BDOS. We're now in a position to discuss the file-handling disk I/O functions. Next month we'll begin by introducing these functions and go on to explain their operation and use. At that time we'll also present the final version of our subroutine library. Until next month. . . .

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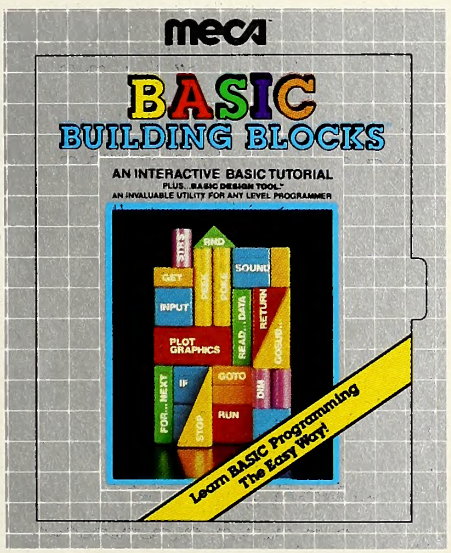

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String Along with VAL

In the opening of last month's column, we suggested that you test out your sort routines with a "few hundred randomly created 'words,' " but neglected to show you how to create random words. This month we offer reparations and apologies to those who care.

ASC and You Shall Receive. The task of creating random words, along with a slew of more useful tasks, is made easier by knowing Applesoft's single-character commands. Two of Applesoft's single-character commands are string functions: one called *ASC*, which translates a single-character string into a number, and one called *CHR$*, which translates a number into a single-character string.

ASC is pronounced the same as "ask." It is short for ASCII ("askee"), which stands for American Standard Code for Information Interchange. The ASCII code is the system of numbers most computers use internally to represent printed characters. All a computer knows, inside, is numbers. In order to deal with characters, it has to have a set of numbers to substitute for those characters in its memory. Those same numbers can be used for other things as well; a computer's programs know from context when a number represents a character.

CHR$, which is pronounced "character string," also uses the ASCII code. The ASC function uses a string expression for its argument and returns that string's ASCII number. If the string is more than one character long, the number returned is the ASCII code for the first character. CHR$ uses a numeric expression for its argument and returns a single-character string.

As functions, ASC and CHR$ can also act as expressions. ASC can be used wherever a numeric expression is called for, and CHR$ can be used wherever a string expression is called for. All of the following statements are legal uses of CHR$ and ASC:

```
A$ = "&":X = ASC(A$)
E$ = CHR$(27)
FOR C = 1 TO ASC("A")
PRINT CHR$( ASC("Gorilla"))
```

To make use of these commands, you have to be familiar with the ASCII code. Nearly every computer programming manual has an ASCII code chart, so we won't include a full one here. However, figure 1 shows the general groupings of characters in the ASCII code. If you have either the II Plus or the IIe version of the Applesoft manuals, you should become familiar with the ASCII tables they include. The ASCII values are given in decimal and hexadecimal. For Basic use, you can ignore the hex column. The charts are on pages 138 and 139 of the old manual and pages 241 through 244 of volume 2 of the new manual. These charts could end up being the most-often-used pages in your computer library.

Decimal values	Characters
1 – 26	Control-A through control-Z
0, 27 – 31	miscellaneous control characters
8	left arrow
21	right arrow
11	up arrow (IIe only)
10	down arrow (IIe only)
13	return
27	escape
32	space
33 – 47	punctuation; math symbols
48 – 57	the numbers 0 through 9
58 – 64	more symbols
65 – 90	capital letters A through Z
91 – 96	more symbols
97 – 122	lower-case a through z (IIe and computers with lower-case adapter only)
123 – 126	more symbols
127	delete (IIe only)

Figure 1. ASCII code groups.

If you ever need to know a character's ASCII value, or if you want to find out what character is associated with a known value but don't want to look it up, you can always ask the computer. To see how, type either of these commands in immediate mode (that is, without a line number):

```
PRINT ASC("M")
PRINT CHR$(122)
```

You Can't Always Get What You Want. Notice that not all of the characters in the code are printing characters. CHR$(0) through CHR$(31) are control characters, which are typed by holding down the control key and hitting another key. These don't print anything on the screen, but a few of them have special significance. CHR$(13) is the code the computer sees when you hit the return key. Printing it adds nothing to the screen, but it moves the cursor to the beginning of the next line. The four arrow keys and escape are also control characters.

You can't see these characters, but your computer can if you type them. Even a Basic program can recognize and act on these invisible characters. Basic can read a single keypress with the *get* command. *Get* is like input except that it takes only one character; it doesn't wait for you

to hit return, and it doesn't print that character on the screen. That makes it useful for writing input routines. It also makes it useful for examining ASCII character codes. This program will accept key presses and print out the codes associated with the keys pressed:

```
10 GET KEY$
20 CODE = ASC(KEY$)
30 PRINT CODE; "("; CHR$(CODE); ")"
40 GOTO 10
```

No Codes from Shifty Keys. You'll see when you run this program that *get* takes anything as input, even control-C. Assuming that you're fast enough to type control-C in the milliseconds that the Apple takes to execute lines 20 through 40, you can use this method to break out of the program. If not, reset will still work. The reset key (actually, control-reset on most Apples) doesn't generate a character code. Instead, it sends a signal directly to the Apple's microprocessor that says, "Stop what you're doing." (Sometimes, of course, the microprocessor will have been programmed not to listen.)

The control and shift keys don't generate codes either. Rather, they change the code generated by other, simultaneous keypresses. That's why capital letters and lower-case letters have different codes. On the Apple IIe, the caps-lock key does the same thing. The open-apple and closed-apple keys on the IIe don't generate or even help to generate any codes. They make the computer think its paddle or joystick buttons have been pressed, even if no paddle or joystick is plugged in. We'll go into how these keys work at another time. For now, it's sufficient to know that they take an entirely different input path: *get* ignores them and they produce no ASCII code.

Now, for those who really want to try out your sort routines (from the January column) without typing in five hundred words to sort, here is a random-word generator. This routine creates a word of random length from random capital letters and returns it in the variable W$:

```
100 REM  random word generator
110 W$ = "": REM  empty the string
120 L = INT( RND(1) * 4) + 4:REM
    length of word will be 4 to 7 letters
130 FOR C = 1 TO L
140 W$ = W$ + CHR$( INT( RND(1) * 26) + 65): REM
    concatenate a  random capital letter
150 NEXT C
160 PRINT W$: REM  optional
170 RETURN
```

Now let's do something a bit more useful. Similar commands and methods to those used in the random-word generator can be used to create a variety of neat input routines.

Surpassing the Standard. You might ask, what's wrong with using the input statement? The answer is that the input statement is good for some things but not for others. It allows too many ways for a user to make mistakes. For instance, if the user backspaces too far, the cursor moves down a line from the input prompt. Applesoft is still waiting for input, but it can be disorienting for the user to have the cursor separated from the prompt. Some programs depend on a carefully laid-out screen where certain readouts appear in certain places (look at any spreadsheet). Using the input command in such a program could mess up the display by scrolling the screen or accepting input of a line that's too long.

Another problem with *input* is that it doesn't take commas. If you want to type, "To be, or not to be," you would get an *extra ignored* message and the computer would have gotten only "To be." That's a heck of a way to treat Shakespeare.

Furthermore, with a custom-designed input routine, you can do all kinds of fancy stuff like limit the length of the input, limit the characters allowed, turn backspace into a true destructive delete key, and even allow the insertion of characters into the middle of a string. Of course, we'll start with the simplest form of the routine and build from there, in true hacker form.

For the simplest-case input routine, we want a closed loop that will take a character and process it. First, it should check to see if the character is a control character. If it is, the routine should see if it's either a return or a backspace, the only control characters we'll pay attention to for now. If the character is a printable one, the routine will print it and add it to the string. Any character that is neither a printable character nor a backspace or return will be ignored.

Figure 2 shows a flow chart for this algorithm. It may look a little complicated, but if we take things one step at a time, it shouldn't be too hard. Let's start with the easy path—the one that goes straight down from the top of the chart. This is the section of the routine that handles characters that can be printed and added to the string. Here goes:

```
100 REM  input routine using get
110 W$ = "": REM  this clears W$
120 GET K$
130 IF ASC(K$) < 32 THEN 200: REM  we'll deal with this later
140 W$ = W$ + K$
150 PRINT K$;
160 GOTO 120
```

That part is pretty easy. It works, too, as long as you don't hit return, an arrow key, escape, or any other control character. That's the secret to writing long, complicated programs: write them one piece—one short, simple, working piece—at a time. Now let's do the backspace part, which, by itself, is also pretty simple:

```
200 IF ASC(K$) <> 8 THEN 300: REM  8 is backspace
210 IF W$ = "" THEN 120
```

You may wonder about the need for line 210. It's there for two reasons: first, to prevent the routine from backspacing to a point before the beginning of the word, which is one of the problems with the input command; and second, to prevent an error message. Remember, the next step is to remove the rightmost character from W$, and if W$ has no characters at the time, Applesoft will get upset with you. To continue:

```
220 W$ = LEFT$(W$,LEN(W$) - 1)
```

This removes the last character from the string being built in memory. It works by replacing the whole string with the string's leftmost N−1 characters, where N is the number of characters in the string.

```
230 PRINT K$;" ";K$
```

This step backs up the cursor one space (remember that K$ holds the backspace character at this point in the routine), prints a space over the character in that location (moving the cursor forward to its original position), and backs up the cursor one space to where it should be now. The space is necessary because the backspace character just moves the cursor; it doesn't erase the characters on the screen.

```
240 GOTO 120
```

Line 240 creates a loop.

Check to see that the routine works. It should now respond correctly to the backspace key, right?

Actually, no. Type a word, then backspace over it. When you try to delete the first character you typed, you get an *illegal quantity error* message in line 220. Aha! The problem is that when the length of W$ is 1, LEN(W$)−1 (the second argument of the LEFT$ function) becomes zero. LEFT$ doesn't know what to do with zero here, so it panics. The routine needs another special condition. This line should do it:

```
215 IF LEN(W$) = 1 THEN W$ = "": GOTO 230
```

Now we can consider the case in which the character typed is return, which is the simplest case of all.

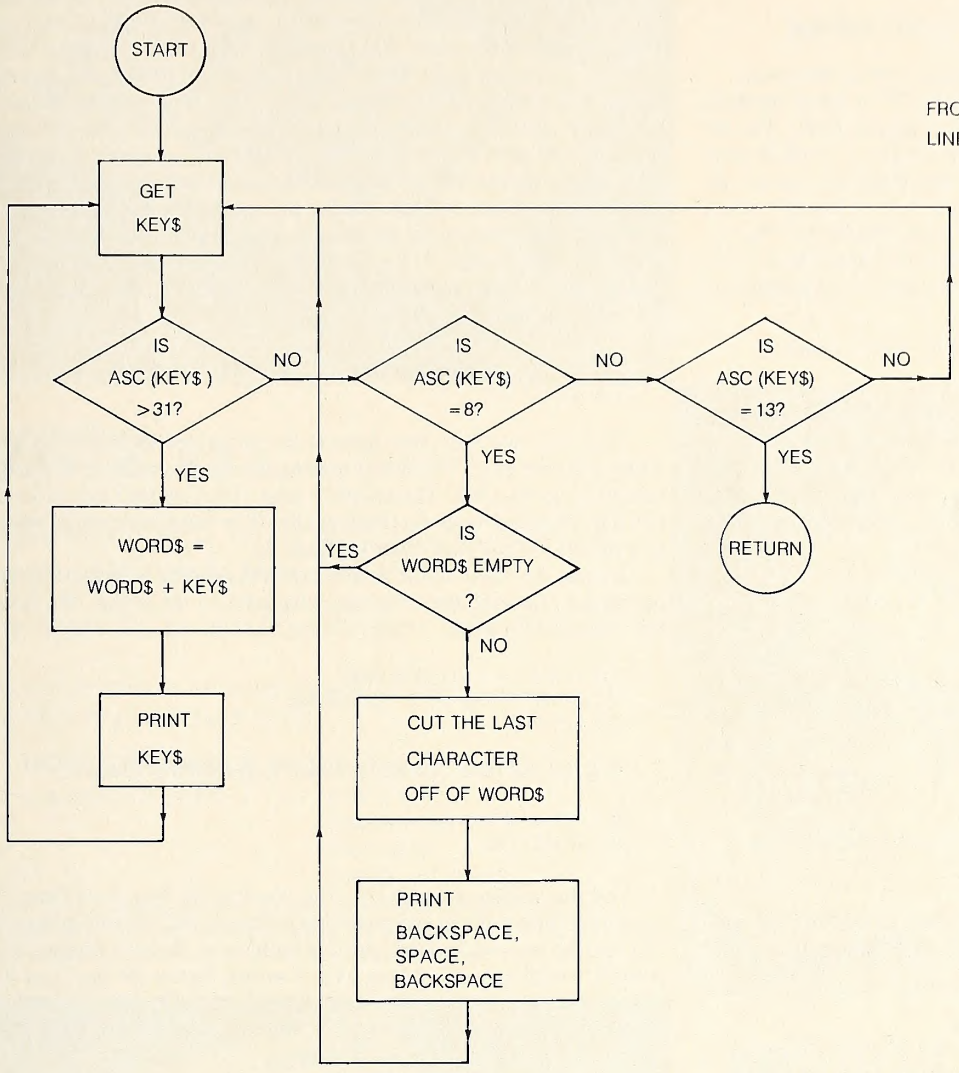
```
300 IF ASC(K$) <> 13 THEN 400: REM  13 is return
310 RETURN
400 GOTO 120
```

To avoid getting a *return without gosub* error, test the routine by calling it with this line:

```
10 GOSUB 100: IN$ = W$: PRINT IN$: END
```

There—now we have the working, simplest-case, input subroutine. You can put this in your program once, gosub to it whenever you want the

Figure 2. Simplest input routine flowchart.



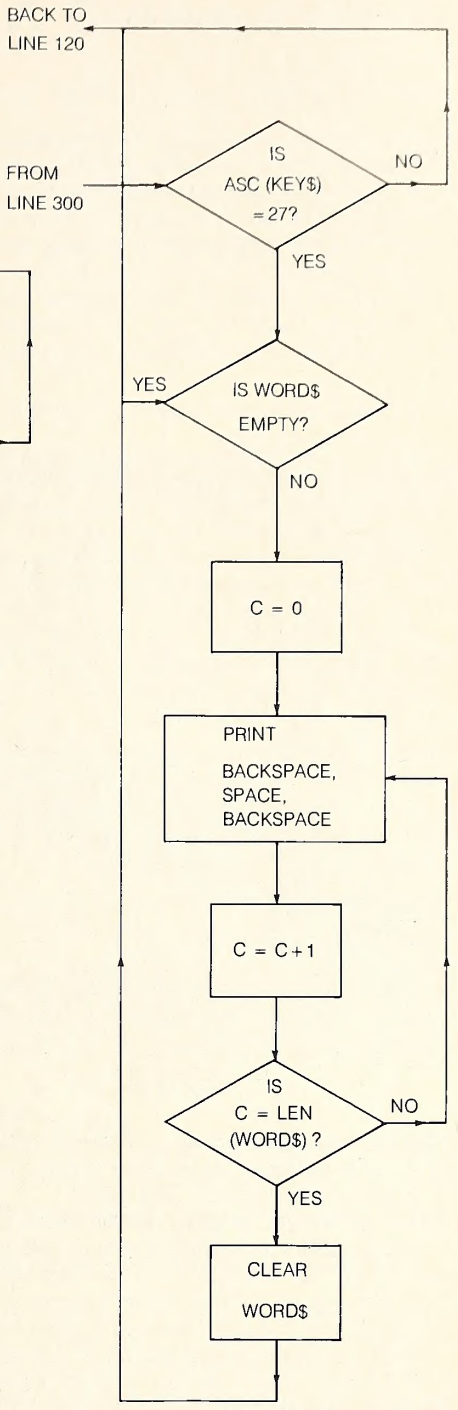


Figure 3. Escape key routine flowchart.

user to type something in, then set the variable you wanted to fill to W$. The old command:

```
INPUT "Type in your name: "; NAME$
```

is now replaced with:

```
PRINT "Type in your name: ";: GOSUB 100:NAME$ = W$
```

The new form is a little longer, but it works a little better—it isn't subject to the peculiarities of the input command—and it can be customized. It can be used with numeric input as well as string input, although numeric input with the input command has one more little annoyance than string input. If you type nonnumeric characters in response to a numeric input, or if you just hit return, the computer responds with a rude reenter prompt and asks for input again. A custom-designed input routine allows the program to respond to this situation in a more civilized way. For instance, if the user just types return (if W$ = "" . . .), the program can put a default value in the variable in question. The program can also check for illegal input, such as a word where a number should be, and gently ask the user for clarification ("I said a number, you dummy!").

All we need to use this kind of input routine is a way of converting strings into numeric values. We could write a conversion routine using ASC and LEN and MID$ and for-next loops, but that's far too complicated. Let's use VAL instead.

VAL Is, Like, Totally Tubular. This is too easy. *VAL* is a function statement that takes a string as its argument, interprets it, and returns a numeric value. If the string can't be interpreted as a number, VAL returns a zero. You can check to see if the zero was a real zero or an "I-can't-interpret-this-number" zero with some condition as:

```
IF VAL(W$) = 0 AND W$ < > "0" THEN PRINT "I said a number,
    you dummy!"
```

That, by the way, was one legal way to use VAL. As a numeric function, VAL can be used wherever an arithmetic expression is appropriate: that is, for-next loops, variable assignments, if-then statements, and fine din-

ing establishments everywhere. So the standard numeric input:

```
INPUT "Please type a number: ";N
```

is replaced with:

```
PRINT "Please type a number: ";: GOSUB 100: N = VAL(W$)
```

plus whatever precautions you, as the programmer, deem necessary.

Of course, whether you want to use this routine for string or numeric input, you have total freedom to customize it to fit your needs. For instance, let's say you have a IIe and want the delete key to work in your programs. With the input statement, pressing the delete key merely inserts a messy-looking cursor character into your text; it doesn't delete anything. We can fix that by *intercepting the input character*. That is, right after the get statement in line 120, we slip in a line to check if the delete key was pressed and, if so, to convert the character to backspace, like so:

```
121 IF K$ = CHR$ (127) THEN K$ = CHR$ (8): REM  convert
    delete to backspace
```

Another type of interception that can be useful is the filtering out of unwanted characters. For instance, if you are going to use the routine for numeric input only, you can prevent certain user errors by allowing the user to type only number characters and the minus sign and decimal point. Just look up those values and construct a condition that filters other characters out, like this:

```
135 IF ASC (K$) < 45 OR ASC (K$) > 57 OR ASC (K$) = 47
    THEN 120:  REM  this permits only numeric input
```

Another handy restriction concerns string length. This would fall in the same place in the program flow as the previous change. It has to allow control characters to get to their respective routines but prevent printable characters from being printed and added to the string if the string is already too long. This will do it:

```
137 IF LEN (W$) = 12 THEN 120: REM  this sets a limit on string
    length
```

One other thing you can do is have your routine respond to other special control characters. These characters could do anything: convert all lower-case letters in the string to upper case, or vice versa; move the cursor throughout the string, allowing input in the middle (this is a little tricky); remember all deleted characters and allow them to be reinserted in last-in first-out fashion by pressing the right arrow key (an idea borrowed from *Apple Writer*); or even delete the whole string and start over. That last one sounds easy. What character shall we use? Escape? Sure!

First, let's think about where to put the routine. Fortunately, the input routine was built to be expandable. Look at the flow chart in figure 2 to determine where hitting escape, which has an ASCII value of twenty-seven, would send program control. That's right—it would send control careening down that row of condition diamonds until the routine realized that it had no condition for accepting the escape key and simply ignored it. Clearly, the place to put the escape check is at the end of the chain of conditions. Physically, in the program, that means we'll put the condition in line 400 and transfer the goto 120, which ends the chain, to line 500. Here is that part:

```
400 IF K$ < > CHR$ (27) THEN 500: REM  27 is escape
500 GOTO 120
```

There are two tasks that have to be performed to delete the whole string and start over. The first is erasing the string on the screen, and the second is clearing W$. The second is easy. The first isn't too difficult. If you don't see how to do it, check out the flow chart in figure 3, which is an extension of the flow chart in figure 2.

Erasing the word on the screen involves printing a backspace-space-backspace sequence once for each character of the string. We'll use a for-next loop for that.

```
410 FOR C = 1 TO LEN (W$)
420 PRINT CHR$ (8);" "; CHR$ (8);
430 NEXT C
```

Next we just clear W$ and go back to get another character.

```
440 W$ = ""
450 GOTO 120
```

Test this routine extensively. Can you find the bug in it? One of the most important skills in programming is finding and removing bugs. For that reason, we *won't* explain the bug in this one. Run the routine, try all possible combinations, find out what's wrong, figure out why, and fix it. Just in case you can't get it, here's the listing in its entirety. The line necessary to fix the bug is in there, but don't look for it until you've really tried to find and fix the problem.

No phones calls, please.

```
10 GOSUB 100: IN$ = W$: PRINT IN$: END
100 REM  input routine using get
110 W$ = "": REM  this clears W$
120 GET K$
121 IF K$ = CHR$ (127) THEN K$ = CHR$ (8): REM  convert
    delete to backspace
130 IF ASC (K$) < 32 THEN 200: REM  we'll deal with this later
135 IF ASC (K$) < 45 OR ASC (K$) > 57 OR ASC (K$) = 47 THEN
    120:  REM  this permits only numeric input
137 IF LEN (W$) = 12 THEN 120: REM this sets a limit on string length
140 W$ = W$ + K$
150 PRINT K$;
160 GOTO 120
200 IF ASC (K$) < > 8 THEN 300: REM  8 is backspace
210 IF W$ = "" THEN 120
215 IF LEN (W$) = 1 THEN W$ = "": GOTO 230
220 W$ = LEFT$ (W$, LEN (W$) - 1)
230 PRINT K$;" ";K$;
240 GOTO 120
300 IF ASC (K$) < > 13 THEN 400: REM  13 is return
310 RETURN
400 IF K$ < > CHR$ (27) THEN 500: REM  27 is escape
405 IF W$ = "" THEN 120
410 FOR C = 1 TO LEN (W$)
420 PRINT CHR$ (8);" "; CHR$ (8);
430 NEXT C
440 W$ = ""
450 GOTO 120
500 GOTO 120
```

GLOSSARY

ASC(string expression): A function that derives the ASCII value of the first character of the string expression. Acts as a numeric expression. See *ASCII*.

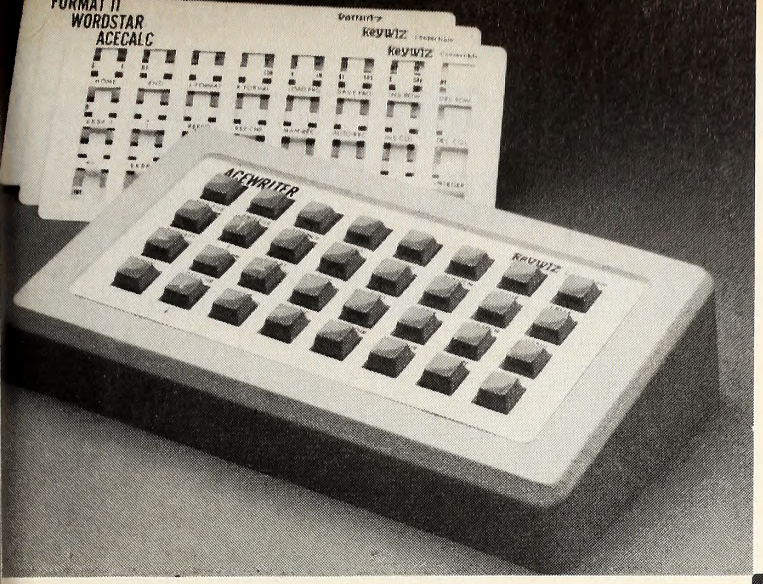
ASCII: American Standard Code for Information Interchange. A code used by most computers in which numbers from 0 through 127 represent all characters that can appear on the screen and all characters that can be entered from the keyboard. Some keyboard characters cannot be displayed and some displayable characters (especially on the Apple II Plus) cannot be typed at the keyboard.

CHR$(expression): A function that derives a single-character string from the numeric expression acting as its argument. The argument must be a legal ASCII number from 0 to 255 (the range from 128 to 255 duplicates the range from 0 to 127). Acts as a string expression. See *ASCII*.

Destructive backspace: A backspace that not only moves the cursor one space to the left but also erases the character in that position.

GET: A command to accept one character of input from the keyboard and put it into a variable. Usually used with string variables, since its use with a numeric variable increases the possibility of an error message should the character accepted be nonnumeric.

Intercepting input: Reading and modifying, eliminating, or otherwise acting on characters as they are entered from the keyboard before the main input handling routine sees them.



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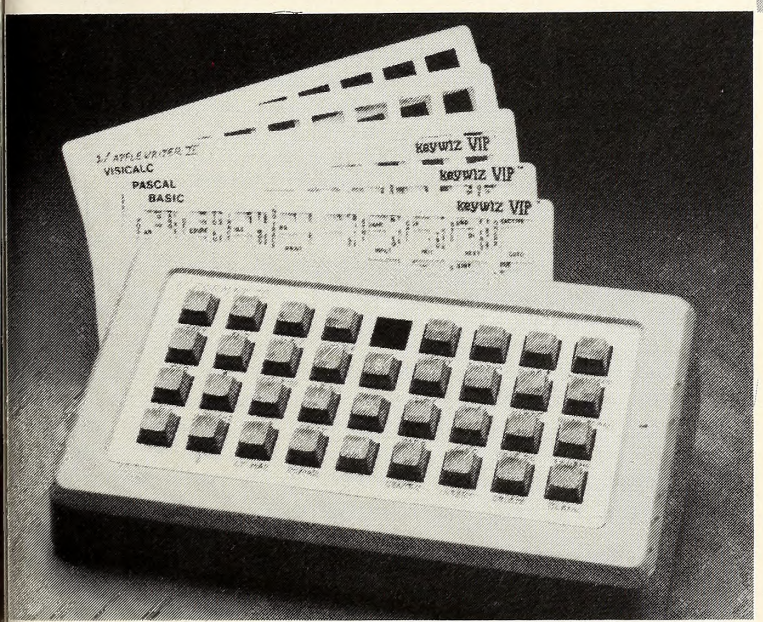

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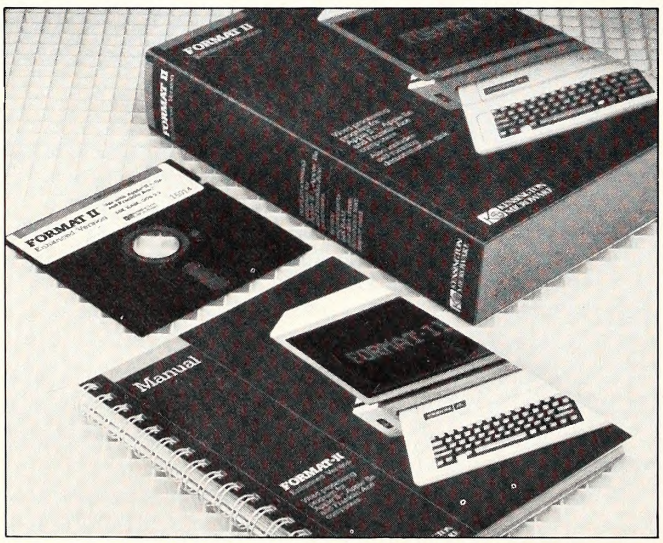

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How to Spend Money: Lesson One

When we last left our hero, Klondike Putz was learning how to type in programs from listings in books and magazines. Let's go back a bit to the time when Klondike first brought his computer home.

As powerful as Klondike's Apple was, it was a machine of minimal configuration—an Apple, a disk drive, and a monitor. It wasn't long before he got bored playing the games he had bought with the system; he wanted the Apple to do more. He had a word processor, a checkbook balancer, a diet planner, and a cheap program that would keep track of how much toothpaste he used each week. But software has its limits.

A great thing about the Apple and other microcomputers is that they're expandable; you can add stuff to them. Things that we add to the Apple in order to give it more power are called *peripherals*. The disk drive is a peripheral; it isn't a necessary part of the machine, only a convenient add-on. A joystick or any game controller is a peripheral. Anything that isn't part of the Apple itself is a peripheral. Let's look at a few popular ones.

Phone Phun. The device that adds the most capabilities to the computer is the modem. Short for *mo*dulator-*dem*odulator, a modem is something that lets the computer communicate with other computers by telephone. Those other computers can be anything from an Apple to a corporate mainframe computer.

Computers handle information in the form of electronic bits. In order to travel from one place to another by telephone, those bits need to be changed into sound, or modulated. That's what the modem does before it sends bits of information across telephone lines; it changes bits into sounds. When the sounds get to the other computer, they need to be converted back to bits for the receiving computer to understand them. That's the job of the modem at the receiving end; it converts the sounds to bits, or demodulates the sound.

A big reason for wanting to connect your Apple to another computer miles away is so you can use the other computer without having to be there. At first, that doesn't seem like such a good reason. After all, microcomputers are called home computers because they let us do our computing at home. But not everything we want is always immediately available (isn't that the way life usually works?)

For example, suppose Klondike has to write a Pascal program for his computer science class at Eczema University. The school, which has limited funds, can afford only twenty terminals to be shared by three hundred students. "Not to worry," thinks Klondike. "I can write my program at home."

Unfortunately, Klondike's Apple doesn't have Pascal, and it would cost a few hundred dollars for Klondike to add it to his system. What's more, the computer science teacher wants everyone to use the school's version of Pascal. No problem. With a modem, Klondike can connect his Apple to Eczema U's computer and write his Pascal program just as if he were using the Eczema Pascal system through one of the school's terminals.

There are almost as many reasons for connecting one's own computer to another as there are reasons for having a computer in the first place. One common use of a modem is to hook up with information systems that are run on remote computers.

Infomaniacs in Action. The simplest version of an information system is the *bulletin board system*, referred to as BBS in modem circles. A BBS is a computerized version of a bulletin board, just like the ones hanging up at the local supermarket. In many ways, a BBS is like a database program that lets callers search for, read, and add information that is stored on a data disk.

Messages on BBSs include for-sale notices (computer equipment, cars, bicycles), game hints, current events discussions, and private messages between callers. Most BBSs don't cost anything to use; all you pay for is the phone call.

Two of the most popular information systems are The Source and CompuServe. Each offers some things the other doesn't, but for the most part they offer similar services. Both let you retrieve, store, and transfer information, make travel arrangements, communicate with other subscribers, play games, compute, order merchandise, do word processing, write programs, and much more.

Some widely used features of CompuServe and The Source are the wire services. Subscribers can call up and read news from international news wires and, if they're running a program to hold the information that comes on the screen, save news stories to a data disk in the form of a text file.

Though most subscribers to information systems are businesses and business professionals, computer hobbyists can often find other hobbyists on the system with whom to share information. Information systems are good places to meet others with similar interests, whether these be computers, aviation, photography, films, music, or raising ants for fun and profit (Klondike's favorite).

Delphi offers many of the same conveniences as The Source and CompuServe (news and sports, banking, airline reservations, shopping, games), and it includes a twenty-thousand-entry encyclopedia for those who want to use their computers for research.

Dialog Information Services calls itself "the world's most comprehensive on-line information retrieval service." It gives subscribers access to more than eighty million items of information in more than one hundred eighty databases (how many of us actually possess eighty million pieces of information?). Dialog isn't something for just anybody with a computer and a modem; for people who do a lot of research it contains just about everything anyone would ever want to know about anything. *Anything*.

Another service that's available for researchers is BRS/After Dark. This one covers such subjects as business and finance, education, energy, the environment, news, patent information, medicine, psychology, social sciences, and the humanities. BRS/After Dark isn't stocked with as much information as Dialog, but it offers enough to keep most people happy. The only restriction of BRS/After Dark is that it can only be used between 6 p.m. and midnight.

Information systems are only one reason why people attach modems to their computers. Programmers and hobbyists also use modems to exchange programs with each other; businesses use them to send and receive reports, memoranda, letters, and financial figures; still other folks use them just because they're fun.

Typing 800 Words Per Minute. After the disk drive, a printer is usually the first thing people want to plug into the Apple. Word processing wouldn't make much sense if we weren't able to print on paper what we created on the screen. Picture it: "Hi, Mom. Klondike here. I wrote you a letter on my Apple, but you have to come here to read it." It just doesn't work.

Whether it's word processing, financial planning, or keeping an address file, being able to produce printed copies (hard copies) of work is convenient and practical. For example, it's sometimes easier to work with a printed copy of a word processing file when revising than to page through the document on the screen. If your word processor doesn't give you a page layout, a hard copy lets you know where some parts of the document appear in relation to others. Besides, it doesn't matter if you're writing a project budget proposal or a letter to Aunt Eleanor; sooner or later it's going to be printed out on paper.

Printers come in two genera—parallel and serial. A parallel printer receives information a character at a time through a connector made of several wires. Characters go to the printer through eight wires, because each character is made up of eight bits. In addition to those wires, the connector has additional wires for special control signals. Think of the cable that connects the computer and printer as a tunnel that's wide enough for an army to walk eight abreast with drill sergeants on the side. That's a parallel connector.

Serial printers receive information one bit at a time through a single wire. As with a parallel connector, some extra wires are necessary for control signals. A serial connector can be thought of as a narrow tunnel that allows the army to pass through in single file only.

Degrees, Dots, and Daisies. Under each genus (parallel or serial), printers come in three main species—thermal, dot-matrix, and letter-quality (daisy-wheel). As with computers, software, and tennis shoes, the kind of printer you should get depends on what you need it for.

Thermal printers print on heat-sensitive paper that comes on a roll. By applying heat to the paper, the printer can make fine pictures and rough draft copies of text material. However, because the paper is rather flimsy and the text characters aren't too clear, a thermal printer isn't one you'd use for printing anything you'd expect to pass on to someone else (the teacher, the boss, or the FBI). On the positive side, thermal printers are inexpensive, quiet, and fast.

The next printer species is the dot-matrix printer. Creatures of this variety get their name from the way they create characters on paper. If you look carefully at a letter or number on the computer screen, you can see that it's made of dots. Dot-matrix printers generate characters the same way. Instead of striking the paper with a character the way a typewriter does, a dot-matrix printer's "hammer" strikes a vertical line of pins that poke out and hit the paper at various places to create a character.

Dot-matrix printers vary in quality; some create characters that look like a bunch of dots, while others place the dots so close together that the printed page looks like it was typed on an expensive typewriter. Dot-matrix printers cost more than thermal but less than letter-quality printers. They also tend to be noisy and just a hair less irritating than fingernails on a chalkboard.

For most purposes, a dot-matrix printer is acceptable. Students can print papers and reports on them; Aunt Eleanor won't mind receiving a letter printed on one (especially if she can't read your handwriting); and some businesses find them suitable for printing business correspondence. Still, there's always the outside chance that the person you're writing to will be one of those anticomputer activists who might take offense at receiving a computer-generated letter, so use discretion. There's no law that says you have to use a computer whenever possible. Only if it's convenient.

The most sophisticated species of printer is the letter-quality printer, sometimes called a daisy-wheel printer because of the daisy-shaped wheel that holds the characters on "petals." A letter-quality printer produces clear characters on ordinary paper (track-feed or single sheet). It works similarly to the way a typewriter works; for each character, a different part of the wheel strikes the paper.

The wheel spins around at a high speed and moves across the page at the same time. When the right character is lined up with the appropriate place on the paper, a hammer strikes the petal, leaving the character's image on the paper—precision timing at its best.

Some letter-quality printers use a ball-type device like that of an IBM Selectric typewriter instead of a daisy wheel, but the printed result is generally the same. Documents printed with a letter-quality printer often look better than those created on a typewriter, and it's impossible to tell where any typing errors might have occurred (not so for typewritten documents; just hold them up to the light and you can see where the typist used correction fluid).

Letter-quality printers cost more than thermal or dot-matrix printers, but the results look the best.

So much for printers.

Hard Promises. Anyone who has an extra few thousand dollars lying around can add a hard disk, or Winchester disk, to the existing setup. Klondike is one of those people.

It took Klondike a month and a half just to get through the *Apple Presents . . . Apple* disk, but then he was ready for bigger challenges. The first thing he wanted to do was use his new word processing program to begin writing his book, *Things I've Learned Too Late*.

Klondike trotted off to the computer store and bought a box of ten disks to store his text files on. "This," he thought, "will set me up for life." After all, one disk holds 140K of information, or about eighty double-spaced pages; his box of disks would hold up to eight hundred pages of text.

A few months later, Klondike had written about five pages of his book (there weren't a whole lot of things he'd learned, let alone too late), but most of his disks were full. When he wasn't writing, Klondike was teaching himself Basic and downloading files from BBSs and other information systems; his programs and downloaded files were what took up most of his disk space.

As a result, he bought a bunch of additional disks, and it soon became nearly impossible to find a particular one when he needed it.

Though most of us aren't as disorganized as Klondike, digging through piles of disks can be a hassle. One solution is to store information on a hard disk instead of on numerous floppy disks. A hard disk is sealed permanently inside its case, safe from dirty air, fingerprints, adventurous children, and other hazards. It can store much more information than a floppy disk, and it reads and writes faster than a floppy disk drive.

Hard disks begin at five megabytes of storage space, which is roughly five million bytes, or 5,000K—thirty-five times the capacity of a normal Apple DOS disk. Some hard disks have a storage capacity of one hundred forty megabytes, but ten megabytes is what most hard disks have. A hard disk costs more than a disk drive, and prices go up as the amount of storage space increases.

Need Versus Want. Before you dash down to the computer store and say, "Hey, sell me this hard disk," it's a good idea to find out whether you really need one. Hard disks are convenient and fun to have, but so are speedboats and private jets.

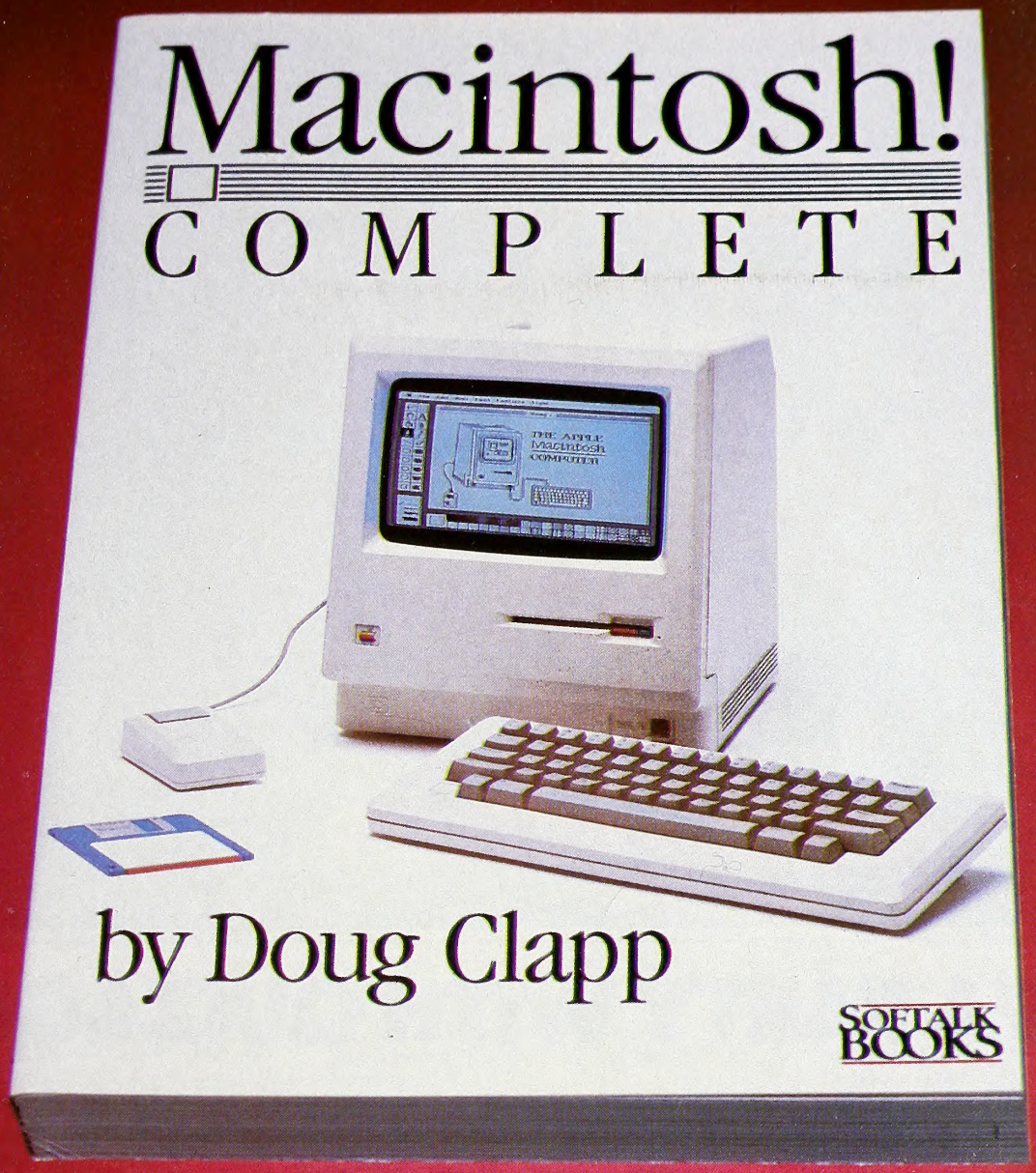
If your Apple is for personal use (home accounting, games, simple word processing), it's likely you don't need a hard disk. By contrast, those who use their Apples for business purposes might want to invest in one if their work involves voluminous data—accounting, database management, or anything that fills up floppy disks quickly.

Because a hard disk can store such large amounts of information, it helps eliminate the problem of keeping track of floppy disks. (The hard disk was a godsend for Klondike. Whenever his floppy disks became too many to handle, he used to go out and buy himself a new pair of shoes so he could use the shoe box as a place to keep his disks.)

As with information stored on floppy disks, it's good practice to keep backup copies of what's stored on a hard disk. A full ten-megabyte hard disk will require about seventy floppy disks to back up, but it's a small price relative to the time spent and ulcers developed when inputting lost data.

But Wait, There's More. Adding things to the Apple sometimes seems like an obsession with some hobbyists. Take a peek inside their Apples; it looks like they felt obligated to fill every available slot. Then they complain about eight slots being too few.

Printers, modems, and hard disks are just a few things that can be added to the Apple. Next month we'll look briefly at some other peripherals, including light pens (for making keen pictures), graphics tablets (an expensive way to make keen pictures), the color plotter (something that draws keen pictures), extra-memory cards, Z-80 cards (which allow the Apple to run programs written under the popular CP/M operating system), and cooling fans to give the Apple some air conditioning. ■



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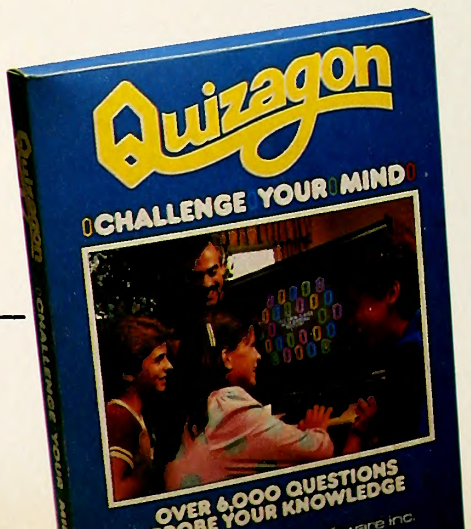

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The Amazing, Wonderful, Fascinating, Complete, Unabridged, And Oppressively Long, All-Time Softalk Reviews Index, (The Last of It) September 1980 Through December 1983

COMPILED BY BETSY BARNES

Old memories may fade with time, but Softalk *reviews live on gloriously.*

What follows is P through Z of an index of every software and hardware review that has appeared in Softalk *through December 1983. Following the product's name, you'll find its author, publisher, name of the person who reviewed it, when the review appeared, and the page where it can be found. "Impression" indicates that a product was given a cursory evaluation. Not all the reviews appeared in Marketalk News, so go by the page numbers.*

Each January from now on, we'll update the index with the previous year's reviews.

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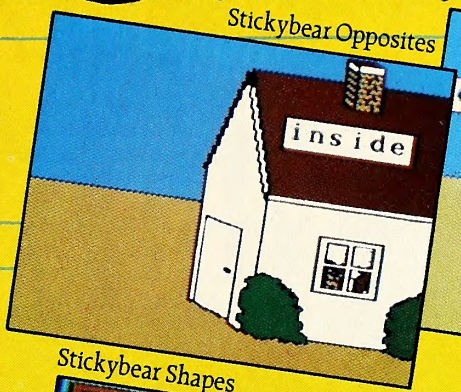

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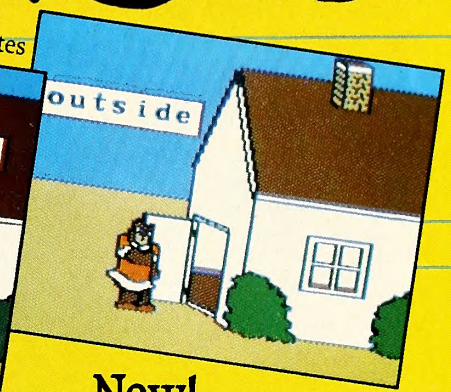

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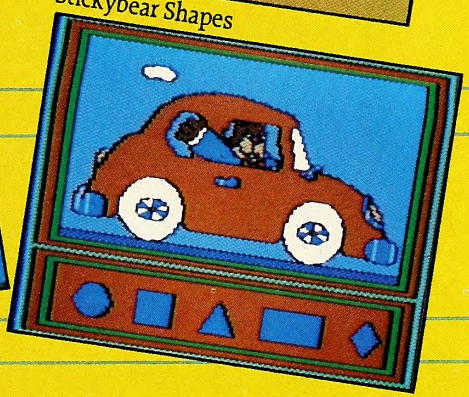

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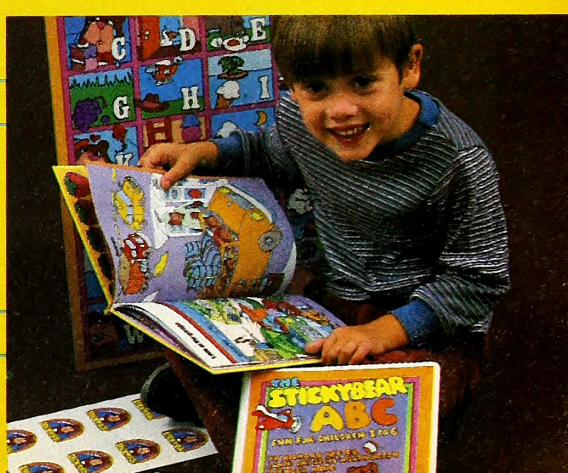

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Spitfire Simulator, by Ted Kurtz, Mind Systems. Reviewed by Don Dyer. December 1982: 225.

Spreadsheet, The, by Randy Wigginton, Guil Banks, and Steve Wozniak, A.P.P.L.E. Reviewed by Al Tommervik. January 1983: 146.

Spy Strikes Back, The, by Robert Hardy and Mark Pelczarski, Penguin. Reviewed by David Durkee. October 1983: 181.

Spy's Demise, by Alan Zeldin, Penguin. Reviewed by David Durkee. November 1982: 181.

Square Pairs, by Glenn M. Kleiman and Steve Minsuk, Scholastic. Reviewed by Matt Yuen. September 1983: 190.

SSM Modem Card, SSM. Reviewed by Jeff Mazur. August 1983: 208.

Stamp Collector, The, by Dick Stein, Andent. Reviewed by Richard Willing. February 1983: 133.

Star Blaster, by Mark Kriegsman and Geoffrey Engelstein, Piccadilly. Reviewed by Karen Kleiner. August 1982: 116.

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Star Gazer's Guide, The, by Kevin Bagley, revised by Robert C. Clardy, Synergistic. Reviewed by Margot Comstock Tommervik. April 1981: 42.

Star Maze, by Gordon Eastman, Sir-tech. Reviewed by Roe Adams. November 1982: 177.

Star Thief, by Jim Nitchals, Cavalier Computer. Reviewed by Al Tommervik. August 1981: 71.

Starcross, by Dave Lebling and Marc Blank, Infocom. Reviewed by Margot Comstock Tommervik. November 1982: 173.

Starmines, by Steve Baker, Softape. Reviewed by Al Tommervik. August 1981: 73.

Starship Commander, by Gilman Louie, Voyager. Reviewed by David Durkee. October 1982: 150.

Statistics with Daisy, by Kevin C. Killion, Rainbow Computing. Reviewed by Jock Root. October 1982: 150.

Stellar 7, by Damon Slye, Software Entertainment. Reviewed by Matt Yuen. September 1983: 186.

Stellar Action, by Frank Heffner, Mytopia Gameware Institute. Impression. September 1981: 72.

Step by Step Two, by John Victor, Program Design. Reviewed by Jock Root. July 1983: 163.

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Stock Portfolio System, Smith Micro. Reviewed by Ken Landis. June 1983: 98.

Succession, by Chris Eisnaugle, Piccadilly. Reviewed by Andrew Christie. October 1982: 153.

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Super Checkbook III, by Jim Powers and Tom Thorpe, Powersoft. Reviewed by Craig Stinson. May 1981: 17.

Super Disk Copy II, by Charles Hartley, Sensible. Reviewed by Theron Fuller. October 1981: 95.

Super Speed Reading, by Art Carpet, Magnum. Reviewed by Margot Comstock Tommervik. September 1983: 170.

Super Stellar Trek, by Tom Burlew, Rainbow Computing. Reviewed by Al Tommervik. August 1981: 72.

Super Taxman 2, by Brian Fitzgerald, H.A.L. Labs. Reviewed by Howard Shore. January 1983: 144.

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Super-Text 40/80, Muse. Reviewed by Peter Olivieri. December 1982: 312.

Suspended, by Michael Berlyn, Infocom. Reviewed by Margot Comstock Tommervik. April 1983: 155.

Swashbuckler, by Paul Stephenson, Datamost. Reviewed by Dale Archibald. August 1982: 114.

Swordthrust, by Donald Brown, CE. Reviewed by Margot Comstock Tommervik. August 1981: 68.

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Symbolic Basic Translator, by Josh Miller, Powersoft. Reviewed by David Durkee. December 1982: 70.

Symtec BSR X-10 Control, Symtec. Reviewed by Jeff Mazur. April 1982: 58.

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TAC, by Ralph H. Bosson, Avalon Hill. Reviewed by William Harrington. August 1983: 173.

Taipan!, by Art Canfil, Avalanche Productions. Reviewed by Roe Adams. October 1982: 149.

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Tawala's Last Redoubt, by Doug Carlston, Broderbund. Reviewed by Margot Comstock Tommervik. September 1981: 64.

Tax Beater, by Jack and Carol Lennard, Datamost. Reviewed by Al Tommervik. April 1982: 114.

Tax Manager, by TASO, Micro Lab. Reviewed by Al Tommervik. April 1982: 114.

Tax Planner, Apple Computer. Reviewed by Margot Comstock Tommervik. December 1980: 20.

Tax Preparer, by James E. Howard, Howard Services. Reviewed by Al Tommervik. March 1981: 34.

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TellStar, by Evan M. Scharf, Information Unlimited. Reviewed by Margot Comstock Tommervik. March 1981: 34.

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TG Joystick, by Ted Gillam, TG Products. Impression. November 1981: 112. Reviewed by Jeff Mazur. April 1982: 58.

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Time Manager, Image Computer Products. Reviewed by Peter Olivieri. July 1982: 188.

Time Zone, by Roberta Williams, On-Line Systems (Sierra On-Line). Impression. January 1982: 101. Reviewed by Roe Adams. June 1982: 116.

Titan Empire, by Ed Zaron, Muse. Reviewed by David Durkee. December 1983: 358.

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Transylvania, by Antonio Antiochia, Penguin. Reviewed by Margot Comstock Tommervik. October 1982: 145.

Triple Arcade Insanity, by Brad Rosen, Avant-Garde. Reviewed by Andrew Christie. July 1983: 162.

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Turbocharger, The, by Roland Gustafsson, Silicon Valley Systems. Reviewed by David Durkee. August 1982: 110.

IIe Tender Keypad, Track House. Reviewed by David Durkee. November 1983: 192.

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U-Boat Command, by Charles J. Fleishman, Synergistic. Reviewed by Matt Yuen. October 1982: 152.

U.S. Constitution Tutor, by Myrna Helfand, Micro Lab. Reviewed by Margot Comstock Tommervik. November 1981: 110.

Ultima, by Lord British, California Pacific. Reviewed by Margot Comstock Tommervik. June 1981: 48.

Ultima II, by Lord British, Sierra On-Line. Reviewed by Roe Adams. January 1983: 138.

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Visichart, by Paul Warme, Interactive Microware. Reviewed by Phillip Good. August 1981: 73.

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VisiList, Computer Station. Reviewed by Craig Stinson. August 1981: 44.

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VisiPlot, by Mitchell Kapor, Personal (VisiCorp). Reviewed by Craig Stinson. July 1981: 14.

Visiprint, Aurora Computer Enterprises. Reviewed by Craig Stinson. August 1981: 44.

VisiSchedule, VisiCorp. Reviewed by Joe Shelton. August 1982: 188.

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Voice Box, The Alien Group. Reviewed by Ethan Winer. April 1983: 166.

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War, by Stan Erwin, Adventure International. Reviewed by William Harrington. April 1983: 169.

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Wavy Navy, by Rodney McAuley, Sirius. Reviewed by Roe Adams. February 1983: 132.

Wayout, by Paul Edelstein, Sirius. Reviewed by Dave Albert. October 1982: 144.

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Witness, The, by Steve Galley, Infocom. Reviewed by Margot Comstock Tommervik. July 1983: 159.

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Wizardry, by Andrew Greenberg and Robert Woodhead, Sir-tech. Reviewed by Margot Comstock Tommervik. August 1981: 69.

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Word Attack!, by Janice G. Davidson and Richard K. Eckert, Jr., Davidson. Reviewed by Jean Varven. March 1983: 138; July 1983: 108.

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Wordrace, by Paul Coletta, Don't Ask. Reviewed by Samantha Good. September 1982: 133.

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World Series Baseball, Datamost. Reviewed by David Hunter. July 1982: 125.

World's Greatest Blackjack Program, The, by Warren Irwin, Carl Cooper, and Lance Humble, Special Delivery/Apple Computer. Impression. November 1981: 108.

Write Away, by Doug Stinson, Midwest Software Associates. Reviewed by Ethan Winer. October 1983: 166.

Wurst of Huntington Computing, The, by Fred Huntington, Huntington Computing. Impression. October 1981: 87.

XYZ

Year at the Races, A, Sportsware. Reviewed by David Hunter. July 1982: 128.

Z-Term, by Bill Blue, Southwestern Data Systems. Reviewed by Greg Tibbetts. May 1981: 25.

Zardax, Computer Solutions. Reviewed by Peter Olivieri. November 1982: 216.

Zargs, by Max McKee, Insoft. Reviewed by Jon Durkee. January 1983: 146.

Zaxxon, by John Garcia, Datasoft. Reviewed by Matt Yuen. September 1983: 167.

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Zenith, by Nasir, Gebelli. Reviewed by David Hunter. August 1982: 110.

Zero Gravity Pinball, by Don Fudge, Avant-Garde Creations. Reviewed by David Hunter. April 1982: 116.

Zoo Master, by Kevin Ryan, Earthware Computer Services. Reviewed by Margot Comstock Tommervik. October 1983: 182.

Zoom Grafix, by Dav Holle, Phoenix. Reviewed by Dale Archibald. February 1982: 63.

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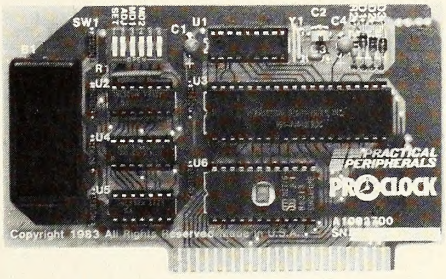

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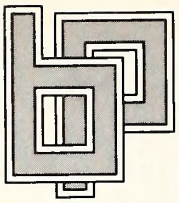

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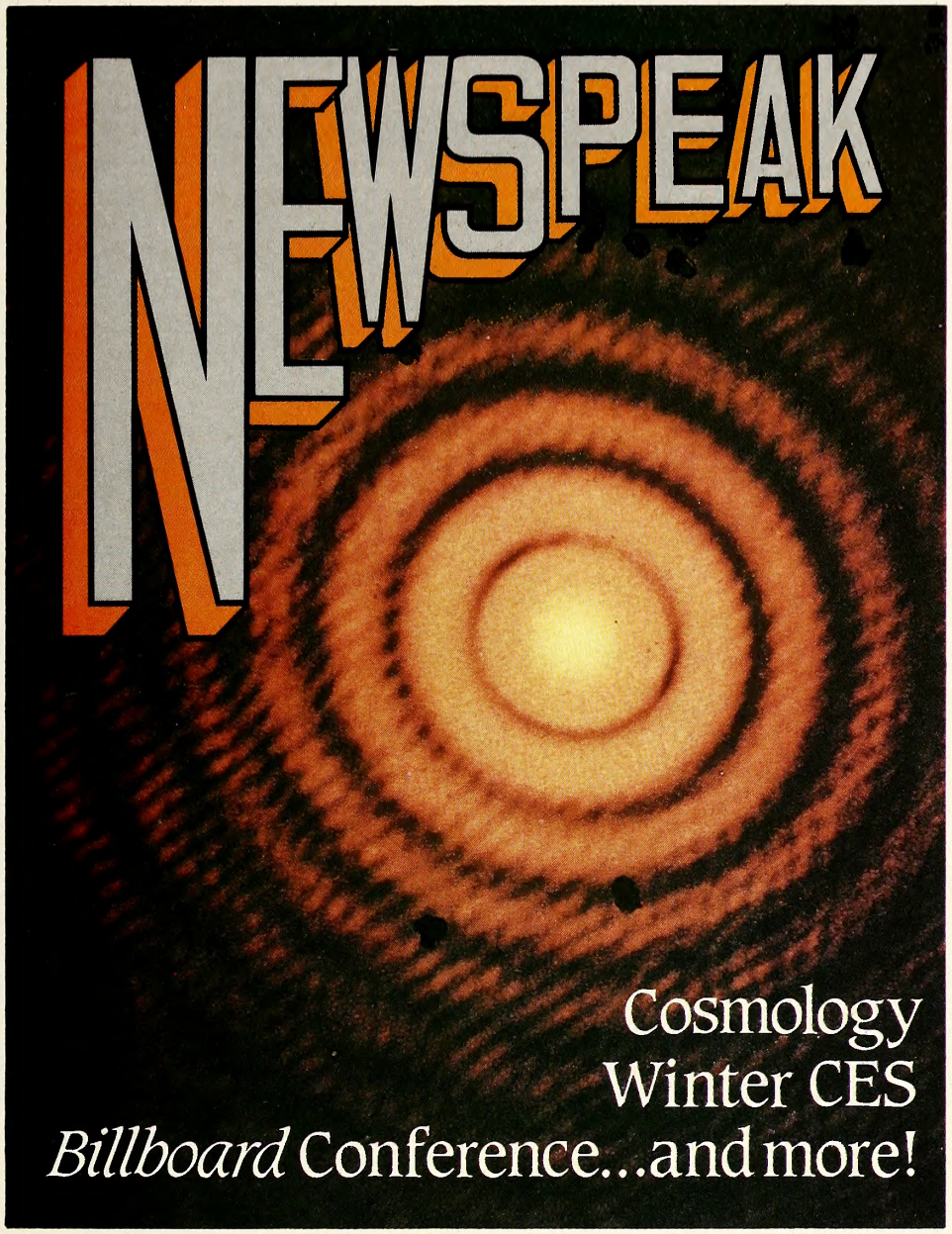


SCIENTISTS PONDER BIG BANG WITH COMPUTER SIMULATIONS

Most physicists agree that modern cosmology—the study of the origin, evolution, and structure of the universe—was born in 1965, when Bell Laboratory scientists Arno Penzias and Robert Wilson accidentally discovered cosmic static. This feeble wash of microwaves is generally considered to be a signal from the universe's beginning. Since this remarkable discovery, which won the two scientists a Nobel Prize, the standard explanation for the origin of the universe has been the "big bang" theory, according to which the physical universe expanded—and is expanding still—from an unimaginably hot and dense point as the result of a gigantic explosion some fifteen to twenty billion years ago.

No, it's not the big bang. The picture above is the diffraction pattern of a helium-neon laser. Photomacrography by John Carnevale, courtesy of AT&T Technologies.

In the 1920s, Einstein applied his general theory of relativity to cosmology. Instead of finding a static universe, as he expected, Einstein found that the universe must be either expanding or contracting; a static universe could not be stable. A few years later, American astronomer Edwin Hubble demonstrated that the universe was indeed expanding—that the galaxies were all rushing away from us (and each other) at a speed proportional to their distance. This discovery was taken as confirmation of the big bang theory.

The task of modern cosmologists, using recent developments in particle physics coupled with relativity theory, has been to run the universe back mathematically—to reverse the cosmic film of time and space, so to speak.

GOTO page 211, column 1

AUTHORS STRIVE TO PERFECT A STANDARD BASIC

It's been twenty years since Dr. Thomas Kurtz and Dr. John G. Kemeny introduced Beginners' All-Purpose Symbolic Instruction Code, or Basic, to the world of computing. What began as a small project at Dartmouth College in New Hampshire ended up bringing the power of computing to millions.

Kemeny and Kurtz's Basic was easy to use. It was so easy that it's still the most popular programming language in the world. The original edition of Basic, although copyrighted, was distributed freely to anyone who wanted to use it. But as the number of computer models increased during the intervening years, a number of different versions of Basic arose with them. It seemed that for one reason or another, each new computer required a different version of the language. Through the years, some pretty bad implementations of "old" Basic gave the language a bad name in some computing circles.

Reacting to the Babel-like confusion and the possibility of someone rushing out with a less-than-wonderful structured version of Basic, Kemeny and Kurtz have joined forces once again to write the definitive version of Basic, called True Basic.

"It was due to the confusion between Basics that we decided to start this effort," says Kemeny, who is still at Dartmouth. "No two Basics on personal computers are compatible, and all of the current versions are quite out of date from the perspective of those of us who have been involved in language development for a long time."

In 1974 the National Standards Committee of the American National Standards Institute (ANSI) began the slow process of developing a voluntary standard for Basic. A "minimal" Basic standard appeared in 1978. Now, Kemeny—who chairs the ANSI subcommittee—sees a way to perfect the language and to introduce a structured version that meets the specifications of the new, "full" standard.

According to ANSI officials, anyone is free to develop a version of Basic that meets the standard, and it is rumored that several large companies are working on their own implementations. So Kemeny and Kurtz are in a race to get True Basic finished and on the market. This time, it won't be available for the asking.

Kemeny and Kurtz formed a small private company named True Basic in August of 1983. The pair felt the need to do their work away from the academic environment. With three systems programmers currently in their employ, they have plans to aim the product at the educational market.

"We hope that True Basic will make it vastly easier for people to write and under-

GOTO page 212, column 2

Winter CES Invades Las Vegas and The Gambling Pays Off for Most

It was business as usual at the 1984 International Winter Consumer Electronics Show, held January 7–10 in Las Vegas, and most participants breathed a sigh of relief. Beyond the flood of gewgaws and the gigabits of misleading information, there was actually some worthwhile business transacted during the show.

The exhibitors came from all over the world and unveiled a wide range of merchandise, all loosely related by the term "electronics." Reacting to the breakup of AT&T, dozens of firms offered phone equipment—everything from Speciality Phone's Phona-football ("America's favorite sport is now America's favorite telephone") and Phona-duck, to AT&T's System 1000 cellular telephone. Quite a bit of acreage was devoted to telephones, watches, clocks, and other high-tech household items, such as Technasonic's Pest Raider.

Most of the major video and audio firms, and plenty of the minor ones, were present. Videodiscs, compact digital discs, and newly released movies on videocassette made up the marketing thrust of these companies. More than one exhibitor in the consumer video industry found an excuse to hook up a VCR and a monitor and show *Making Michael Jackson's "Thriller"* on a continous loop.

Personal computers and video games held their own amid the near-hysterical high-tech wash. There were plenty of new computers and some new software products. Apple, of course, chose not to announce or display Macintosh. Instead, the company took a small booth off to the side and courted the education market. IBM chose to skip the scene altogether, though the PC*jr* was in evidence at various booths.

Microsoft's MSX standard (see Newspeak, August 1983) continued to fail to cause excitement. SpectraVideo was the only American company at the show with an MSX computer, and they had to obtain demonstration cartridges from a company in Hong Kong (which had, in turn, imported them from Japan). The three U.S. companies that had previously announced support of MSX—Spinnaker, Sirius, and Sierra On-Line—modified their positions somewhat, saying in effect that they'd support MSX if it ever became popular.

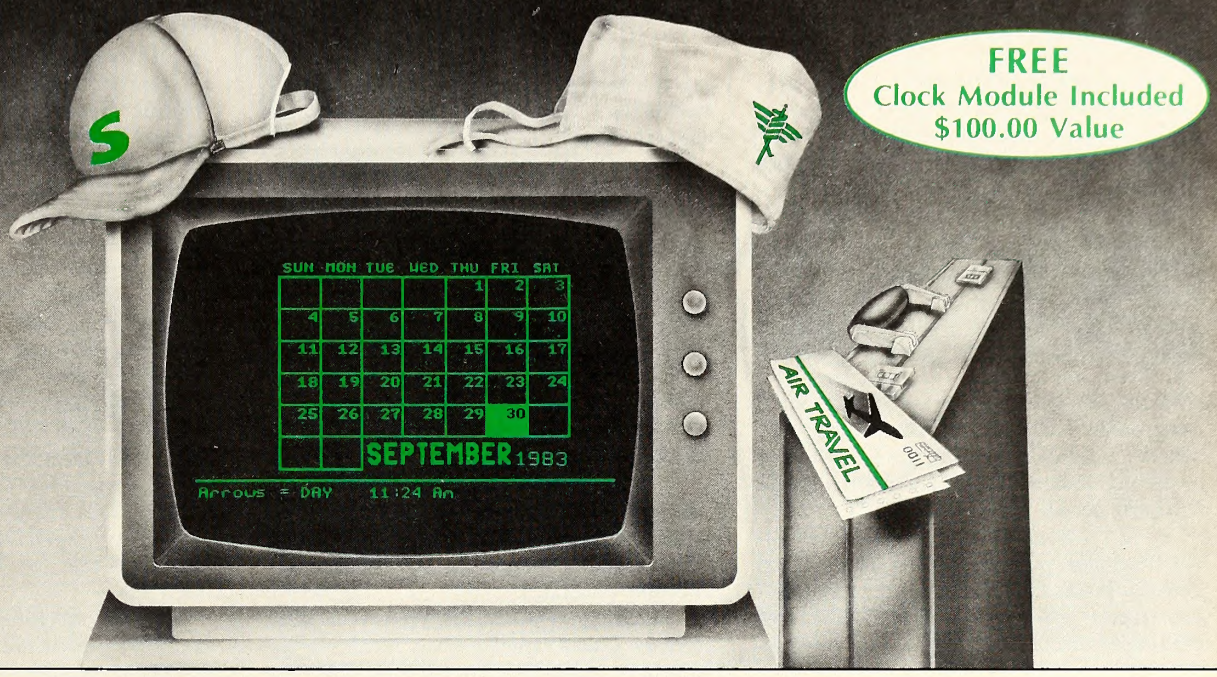
Commodore showed the software-bundled Commodore 264 (to be officially introduced this April Fool's Day) and held its twenty-fifth anniversary/we-made-a-billion-dollars-this-year party at the MGM Grand. The company's top brass addressed the assemblage and kidded around about Commodore's high rate of employee turnover. Chairman Jack Tramiel spoke in glowing terms about the performance of his company and its commitment to the future. (He resigned five days after the show.)

Coleco was up to its old piggyback tricks, announcing another "plug-in module," this one making the company's Adam computer compatible with the IBM PC. The company will also bring out a videodisc player for the Adam.

Leonard Nimoy stood quietly at the HESware booth, busily signing autographs in his new role as corporate spokesvulcan for the Commodore software house. In an unrelated development, Sega drew crowds across the way with more personal computer versions of *Star Trek: The Search for Spock* than you could shake an EPROM at.

After four days of dealing, demonstrating, gambling, and partying, the 1984 Winter CES came to a close. The Summer CES will be held in Chicago June 3–6. AC, DH

Suzie's First Softball Game. . . The Two Places-At-Once Schedule . . .Meeting With The Boss.



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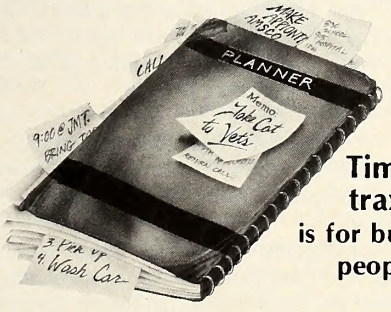

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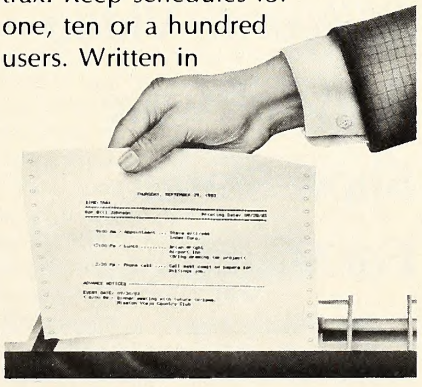

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New High-Flying Camera Soars Above the Scene

Zooming and swooping around on suspended cables, a new kind of motion picture camera system called Skycam should be offering television viewers of the 1984 Summer Olympics some extraordinary new perspectives on the Olympians and their events.

Skycam is the latest inspiration of cinematographer Garrett Brown, who in 1978 earned himself the coveted Academy Award for technical achievement with another of his creations—the Steadicam. Brown's shock-resistant Steadicam virtually revolutionized both film and television camera work. A single cameraman could perform complicated maneuvers, such as wandering through a crowd of people, without the shakiness of traditional handheld camera work.

Brown's latest innovation addresses another technical problem that has long plagued cinematographers of major stadium and outdoor events: how to get the camera down into the action without being confronted by the impracticalities and dangers of putting a cameraman in the way of, say, a 250-pound rampaging cornerback.

Brown's answer? Suspend a camera by four cables slung from any four suitable structures located around the perimeter of the site. The camera, situated on a motorized pivoting yoke and moved by four connecting cables, has unrestricted movement within a three-dimensional area.

Controlled by a 256K eight-megaHertz computer from Sage Technology and moved by a joystick from the operation console, the Skycam tracks around a field on the cables, which are fed out of drums located at the bases of the four supporting structures. If the operator wants to move the camera, he instructs the system to let out cable from two of the structures and draw cable in from the two opposing structures.

Increasing or decreasing the overall slack from the drums simultaneously will lower the camera to within inches of the ground or raise it high above the action. The entire apparatus can be set up by a crew of technicians in a matter of hours.

"Stability is a crucial factor," observes Brown. Keeping a camera that's dangling from cables stable against stadium winds is no easy feat. Brown used motion sensors and gyroscopes, similar to those found in the guidance systems of jet aircraft, to keep Skycam's movement uniform and smooth.

In all, sixteen different camera adjustments—including height, pitch, roll, and yaw—had to be handled simultaneously by the computer.

"The program had to control many motorized devices at once," says project software developer Larry Cone. "The main computer had to be able to communicate with its satellite 6809 motor control processors over very long distances without radio or electronic interference." This was accomplished using an RS-232 serial interface and fiber optic cables.

Cone decided to write the control software in Forth. "Development time was shorter than it would have been if we'd worked in assembly language, and we still retain access to the whole range of system facilities."

"Problems in timing and interface make the programming of computer motion control devices somewhat different from usual programming tasks," says Cone. But from a user's point of view, "Skycam plays like the world's largest video game."

Shooting video cameras by remote control is one thing, but how does a cinematographer, using film, know if the shot is in frame and focused when he is sitting at an operation console a thousand feet away? Brown solved this problem by using a specially designed ultralight Panavision camera—dubbed the 'Garrett'—that has a built-in through-lens video link.

A public unveiling of the prototype Skycam system occurred in June of last year. A new silent, weatherproof version is now being marketed by Brown's new company Skyworks. Inquiries are already coming in from producers, directors, and cinematographers about its use in films, concerts, and sporting events.

How do performers and spectators react to Skycam's swooping down out of the sky? "People glance at it," replies Cone, "but they aren't distracted by it." HAS

Billboard's Video And Software Show Slated For March

Billboard, a leading music industry weekly, is sponsoring a three-day conference on computer software and video games at the Westin Saint Francis Hotel in San Francisco, March 7–9. Attendees should have serious avocational, if not vocational, interest in the subject, as registration is $350.

The conference includes ten lectures, an awards banquet, an experts' panel luncheon, and numerous demonstrations of new entertainment, educational, and home management software designed for Apple, IBM, Atari, and Commodore microcomputers.

The registration deadline is March 5. For more information, call or write *Billboard*'s Los Angeles office in Beverly Hills, California.

Last spring's *Billboard* conference, the first of its kind sponsored by the magazine, focused on video games, and drew about one hundred fifty manufacturers, programmers, retailers, and distributors. This conference, which will focus primarily on microcomputerware, is an extension of the magazine's growing coverage of the software industry—a progression that has gone from music to music videos to video games to home computer software, particularly entertainment software.

Billboard began editorial coverage of the software industry about a year ago, with reports on new products and the retail end of the business. The publication began the charting of bestselling software about six months ago. It charts the top twenty entertainment titles, as well as the top ten education and home management programs. The weekly survey covers overall sales for all the most popular brands of personal computers. JP

Cosmology

continued from page 207

The tools used to create these universal biographies are large computers.

By feeding computers huge batches of data based on particle physics, scientists hope to simulate the evolution of several possible universes. In response to the data, the computers provide graphic "snapshots" of these various models at different stages of their development.

The reason for this effort is obvious. There are too many unanswered questions about our universe, questions that are highly relevant to our present existence. Why is the matter in the universe distributed in the manner in which we find it? Is the universe composed of primarily luminous matter, or are some dark cosmic constituents eluding our vision? The laws of physics dictate that if there is too much matter in the cosmos, eventually the universe will fall back on itself. Could it be that we are in an expansion phase of a perpetually oscillating system?

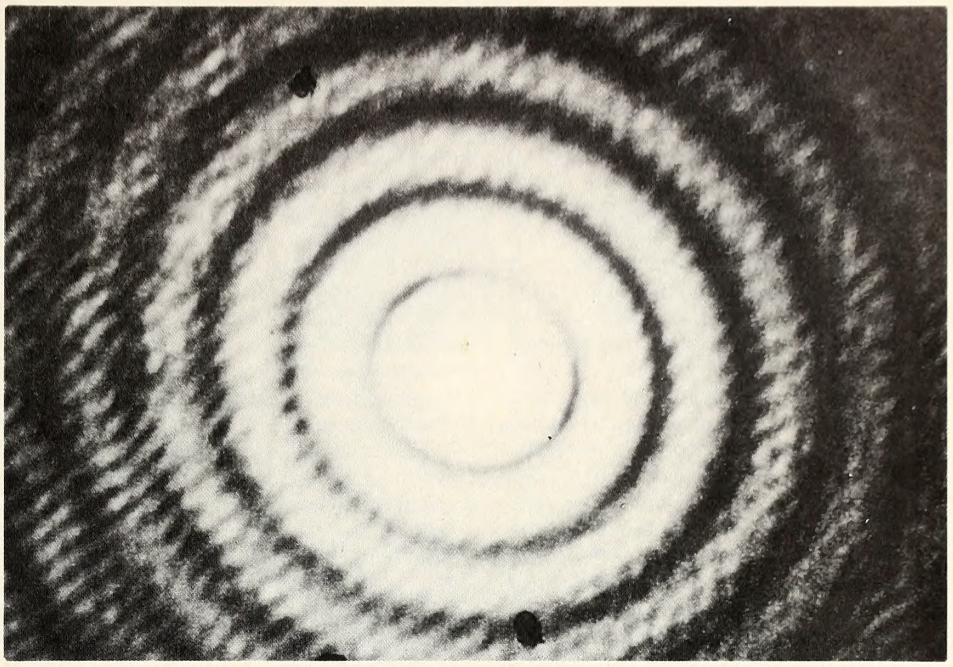
Reconstructing the history of the entire universe is no simple task, and even the largest computers help cosmologists glimpse only part of the picture. The best methods, for the moment, involve simplifying the model in question until it's stripped of all but the most pertinent characteristics.

Nearly all simulations to date have illuminated the cosmic history of only one kind of particle at a time. In the early 1970s, simulation studies were focused on hydrogen, the most abundant element in the universe. Cosmologists first looked to see whether the element was randomly distributed at the birth of the universe. (The hydrogen we find today in the observable universe is certainly not randomly distributed; it's clumped together into galaxies, oceans, and living beings.)

Results of those initial studies suggested that hydrogen was not randomly distributed at the beginning, but the studies could not account for such nonrandom phenomena as superclusters—enormous spaghetti-like strings of clustered galaxies. Essentially, the present universe consists of these superclusters, separated by vast wastelands nearly devoid of matter.

In attempts to verify a random distribution of matter, astrophysicists in the 1970s used the "auto-correlation" function. Starting with any particular galaxy, the auto-correlation function measures the odds of finding another galaxy at any given distance. Generally, this probability varies as the distance changes.

When the computers' predictions were compared with real astronomical observations, however, they did not match. Cosmologists then went back to their proverbial drawing boards and tried to posit a set of initial conditions that could have produced a universe made up of superclusters and voids. They're still trying and some interesting scenarios are emerging as a result of this work.



Current cosmological theories postulate that as positively charged protons began to latch onto negatively charged electrons to form hydrogen in the cooling, half-million-year-old universe, photons (elementary particles of light) were freed. Such "decoupled" light then traveled, more or less unopposed, throughout the cosmos. These photons are relics of the big bang and offer a glimpse of what the universe was once like.

Ancient photons, their energy diminished to the level of microwave radiation, constituted the annoying static that Penzias and Wilson discovered in 1965. Further measurements have shown that the earth receives the same amount of this electromagnetic background noise, at the same energy levels, from all directions in space. This uniformity indicates that the photons were evenly distributed at the time of decoupling, implying that protons and electrons were evenly distributed as well.

However, computer simulations have shown that the supposedly smooth initial distribution of light and hydrogen cannot account for the observed clumping of matter in the present universe. In the late 1970s, researchers realized that they had probably oversimplified their computer models. So in recent years, such notions as "inflation"—first proposed by MIT's Alan Guth—have become popular theories for explaining what happened during and right after the bang.

The possibility that there's some kind of matter in the universe that has so far eluded our observation is also a big topic among cosmologists. Clustered galaxies clocked at high speeds have been puzzling astrophysicists for years. The mass of these clusters appears to be insufficient to hold them together by gravity alone, but estimations of their mass have been based on the amount of luminous matter they contain. Perhaps there's some electromagnetically "dark" matter providing additional gravitation.

Cosmic dust, cold, planet-sized rocks, black holes, and a variety of subatomic particles have all been nominated for the dark-matter role. But these candidates were eliminated by cosmologist Adrian Melott, whose computer simulations showed that for the matter to be baryonic (consisting of protons and neutrons clustered in atomic nuclei), there would have to be far more helium and deuterium in the universe.

Another candidate for the dark matter was

GOTO page 212, column 1

Cosmology

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the elusive neutrino—an elementary particle decoupled from the rest of cosmic matter early in the life of the universe. Neutrinos may have had lumpier distributions than hydrogen at the photon-decoupling epoch (the usual starting point for computer simulations). The evidence was encouraging, but there was one problem: Neutrinos are allegedly massless. In 1980, however, a controversial Soviet experiment claimed to show that neutrinos do have a minuscule, but definitely nonzero, rest mass.

The neutrino would provide about the right amount of missing mass to explain the cohesiveness of galactic clusters, and initial computer simulations along these lines—tracking only neutrinos—resulted in collections of matter much like those we observe today. In addition, some researchers believed that ordinary "hydrodynamic" baryonic matter (found in stars and human beings) would probably tag along with the neutrinos.

But when the auto-correlation function (the observed probable distance between galaxies) was applied to these models, the computer snapshot showed a universe too young to correspond to the one we know and love. In it, matter would be just starting to clump, indicating that the galaxies were formed just the other day, cosmically speaking; this is not consistent with observation. Researchers now realize that for simulations to be accurate, baryonic matter (not just neutrinos) must be included, and they are proceeding with computer simulations along these lines.

Other researchers are considering still more controversial particles as the dark matter. The latest models rely not on known particles, but on theoretical particles such as axions, gravitinos, and photinos.

Cosmologists are a long way from solving all the mysteries of the universe. The speed and storage capabilities of present-day computers have been strained to the limit, so cosmologists must now await the advent of bigger, better, and faster computers—the much-anticipated Fifth Generation. Perhaps it is presumptuous to think that better machines will help us re-create an event that occurred twenty billion years ago, but they certainly offer us a better chance of understanding our past, our present, and possibly our future. DH

Basic

continued from page 207

stand the language. We're promising interested parties that within two years they can have True Basic running on all of the leading personal computers."

Publishing houses—which currently are in the uncomfortable position of having to bring out numerous versions of any book that contains Basic programs—have expressed interest in True Basic.

"We hope that in the future these companies can publish just one book written in True Basic," says Kemeny. "Oh, they'll have to have different disks for the varying systems, but the authors only have to write the code once. Several publishers are very excited, and we're very close to signing a major contract."

Not everyone, though, is enthusiastic about a standard Basic. Many companies have invested enormous amounts of money in old versions of Basic, and they will look long and hard at anything new before dumping what they have supported up until now. If the language becomes popular, however, the wait-and-see attitude may change.

What differences are there between the old Basics and True Basic?

"The most important feature is that True Basic is a fully structured language," Kemeny explains. "If one had to compare it to another language, Pascal would be a good example. True Basic has room for external procedures and the programs are very easy to read.

"True Basic is also compiled," Kemeny adds. "This compiling pass is really crucial. A compiler will find all of a program's syntactic errors very quickly. These are the most common errors, and the program will not execute until it is free of these syntactic problems. Now, if the errors happen to be located way down in the program code, an interpreted Basic will grind away until it gets to that particular line where the error is located. After wasting ten minutes, you're informed of the error."

Kemeny indicates that he and Kurtz are trying for a happy medium. They have spent a great deal of time on the design of the language. A full compiler is usually too large to operate within the confines of a small computer. Consequently, True Basic will offer half-compiled and half-interpretive operations.

"When we first wrote Basic, it was very simple," Kemeny says. "Over the years, advanced features were added. My design criterion was that no advanced feature could be added to Basic if it made life harder for the beginning student."

Field-testing of True Basic will take place this summer, with a version available for the IBM PC by September of this year. Why was the IBM PC picked as the initial vehicle for True Basic?

"At the time our company was formed last year, the Macintosh and the PC*jr* hadn't been announced," Kemeny explains. "We picked a popular personal computer with the necessary amount of memory." Because of the compiler, it takes a 128K machine to run True Basic. "There will be a Macintosh version in the not-too-distant future, but there won't be a version for eight-bit computers due to the memory constraints."

Kemeny is enthusiastic about the future of True Basic. "This is an extremely high-quality language with a wonderful user interface," he states. "True Basic is much larger and more powerful than current Basics." HL

☐ **Collector's Item.** Buyers of Pryority Software's new adventure, *Forbidden Quest*, may be getting more than they expected from the art prints included with the game. The prints, by comics artists Frank Cirocco and the late great Wally Wood, are provided as a bonus and as a source of clues to the adventure. That, of course, is a fair incentive for adventurers who appreciate artwork, especially since Wally Wood is known as one of the "Golden Age" artists in the comics field; his work for EC Comics in the fifties is now legendary. Wood died suddenly late in 1983, and this could further increase the value of his single-color print included with Pryority's game. MB

☐ **Opting for Optics.** Technology Opportunity Conference (San Francisco, CA) is holding a meeting called Optical Storage of Documents and Images March 13–15 at the Biltmore Hotel in Los Angeles. Read-write and read-only storage of analog and digital information—including office documents, engineering drawings, and parts catalogs—will be covered and demonstrated. For further information, contact Technology Opportunity Conference in San Francisco.

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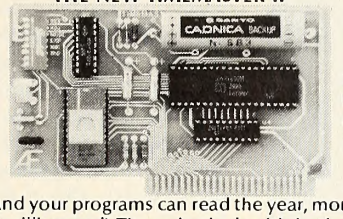

NEW 1984 DESIGN An official PRO-DOS Clock

- Just plug it in and your programs can read the year, month, date, day, and time to 1 millisecond! The only clock with both year and ms.
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- The TIMEMASTER II will automatically emulate the correct clock card for the software you're using. You can also give the TIMEMASTER II a simple command to tell it which clock to emulate (but you'll like the Timemaster mode better). This is great for writing programs for those poor unfortunates that bought some other clock card.
- Basic, Machine Code, CP/M and Pascal software on 2 disks!
- Eight software controlled interrupts so you can execute two programs at the same time (many examples are included).
- On-board timer lets you time any interval up to 48 days long down to the nearest millisecond.

The TIMEMASTER II includes 2 disks with some really fantastic time oriented programs (over 40) including appointment book so you'll never forget to do anything again. Enter your appointments up to a year in advance then forget them. Plus DOS dater so it will automatically add the date when disk files are created or modified. The disk is over a $200.00 value alone—we give the software others sell. All software packages for business, data base management and communications are made to read the TIMEMASTER II. If you want the most powerful and the easiest to use clock for your Apple, you want a TIMEMASTER II.

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Super Music Synthesizer
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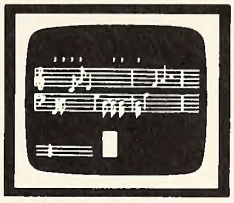

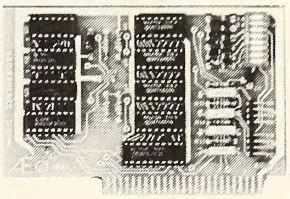

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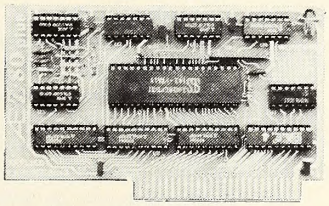

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- Specifically designed for high speed operation in the Apple IIe (runs just as fast in the II+ and Franklin).
- Runs WORD STAR, dBASE II, COBOL-80, FORTRAN-80, PEACHTREE and ALL other CP/M software with no pre-boot.
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SUPERTERM	MORE	NO	YES	NO	NO	NO	NO	YES	YES
WIZARD80	MORE	NO	NO	NO	NO	YES	NO	YES	YES
VISION80	MORE	YES	YES	NO	NO	YES	NO	NO	NO
OMNIVISION	MORE	NO	YES	NO	NO	NO	NO	YES	YES
VIEWMAX80	MORE	YES	YES	NO	NO	YES	NO	NO	YES
SMARTERM	MORE	YES	YES	NO	NO	NO	YES	YES	NO
VIDEOTERM	MORE	NO	NO	YES	NO	YES	YES	NO	YES

The VIEWMASTER 80 works with all 80 column applications including CP/M, Pascal, WordStar, Format II, Easywriter, Apple Writer II, VisiCalc, and all others. The VIEWMASTER 80 is THE MOST compatible 80 column card you can buy at ANY price!

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☐ **"You Toucha My Micro, I Laugha in Your Face."** A new product with the potential to reduce the theft of car radios, TV sets, telephones, and other microprocessor-controlled products was recently introduced by International Electronic Technology Corporation of Far Rockaway, New York. The company has developed what it calls the Kaish Circuit Lockout System, an electronic coding program that can be applied to microprocessor chips. The system makes use of three different digital codes, two of which are applied at the factory. The third is a personal code of the owner's choosing. Once a unit is fully programmed, disconnecting it from the power source or tampering with it in any way will render it inoperable unless the proper owner-specified code is entered. The idea is to deter the theft of many common electronics products by making them unsellable. The company estimates that adding the Kaish Circuit Lockout System to a given product will add less than five dollars to the cost of manufacturing. International Electronic Technology has applied for a patent on its system and plans to license it to manufacturers.

☐ **Tubular Computers and Roboobs.** Computers and fanciful robots are popular items these days in Hollywood. NBC's *Knight Rider* features a computerized car named KITT, with a voice that sounds like H.A.L. in *2001: A Space Odyssey*. ABC's midseason entry, *Automan*, focuses on a translucent crime fighter, a computer game figure brought to life by a young cop—*Pac-Man* wearing a white hat. The neon Automan has a holographic sidekick named Cursor. NBC's midseason newcomer, *Riptide*, features a faintly reptilian-looking Roboz the robot. And a computer is a regular on NBC's *Silver Spoons*; the main character uses it to predict the outcome of football games and to gain access to databases. Both ABC's *Blue Thunder* and CBS's *Airwolf* feature high-tech, computerized helicopters. Later this year, ABC plans to air a two-hour TV movie/series pilot called *Midas Valley*—a Silicon Valley saga by Ann Bickett.

☐ **No Burning Notebooks When School's Out.** A study conducted by International Resource Development (Norwalk, CT), a technology-oriented market research firm, predicts that by 1988 an increasing number of students will use portable notebook-sized computers for doing homework, taking notes, and grading their teachers. Students' computers will be interrogated by the Board of Education's computer; thus, the board will be able to confidentially track students' progress as well as their teachers' effectiveness. At year's end, the teachers' "grades" would be used as the basis for determining merit pay, Jan Ancker of the IRD research staff says. Through the years, the computer would retain in memory the speed at which a child learned each subject, as well as pertinent facts about the child's educational history and achievements. "As the child approaches eighteen, the Scholastic Aptitude Tests will be rendered unnecessary for admission to colleges," Ancker

says. A student's degree of knowledge and rate of mental development will be available to the college of his choice straight from the sealed memory chip in his notebook computer. CP

☐ **Hostiles on the Horizon.** The Robotics and Remote Handling in Hostile Environments meeting will be held April 23–26 at the Sheraton Hotel in Gatlinburg, Tennessee. Sponsored by the American Nuclear Society's Remote Systems Technology Division (ANS/RSTD) and the Oak Ridge/Knoxville ANS Section, the meeting will focus on the use of robotics in nuclear power plants and other hostile environments. For further information, contact the show's technical program chairman in Oak Ridge, Tennessee.

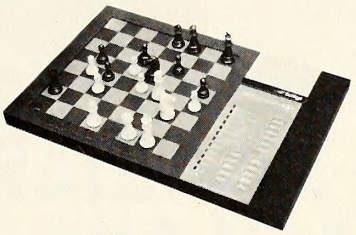
☐ **Dishing Out Satellite Info.** The Book Publishing Company (Summertown, TN) has released *The World of Satellite Television*. The book's authors, Mark Long and Jeffrey Keating, have compiled a reference guide for the accomplished home video enthusiast, as well as an easy introduction to satellite technology for the newcomer. The 224-page volume covers receiving dishes, feedhorns, low-noise amplifiers, polarizers, and other accessories, as well as providing information on troubleshooting, legal concerns, and methods of installing your own system. *The World of Satellite Television* also includes useful facts about existing satellite channels in different parts of the world.

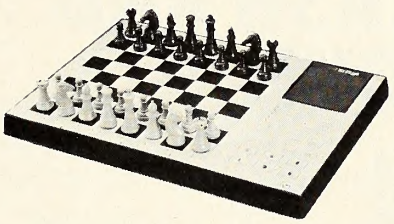
☐ **Southern Style CAD.** The 1984 Computer Aided Engineering and Manufacturing Seminars and Exhibition will take place May 7–11 at North Carolina State University in Raleigh, North Carolina. For more information, contact the NCSU division of continuing education in Raleigh.

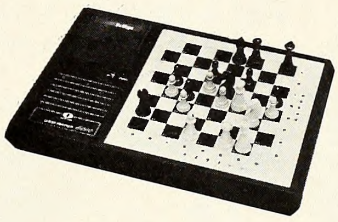
☐ **Hotel Modem.** Some hotels provide computers for their guests, and some make it easier for guests to use their own machines. Soon, people who stay at the Stanford Park Hotel in Menlo Park will be able to use their personal computers with a minimum of hassle. The 165-room hotel, scheduled to open in May, will feature an extra telephone line in every room so that guests can communicate with the outside world by modem. In keeping with this high-tech approach, the hotel rooms don't have conventional keys. Instead, each guest will be assigned an electronic card programmed with a combination. When a guest checks out, the combination will be changed; thus, the Stanford Park will be providing one of the most advanced hotel security systems available.

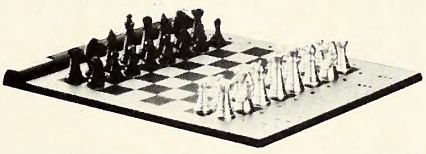
☐ **Tackling the Two Thousand.** Future Computing (Richardson, TX), an information services firm specializing in the personal computer industry, has released *The Fortune 1000 Personal Computer Market Report*. The report indicates that in 1985 alone, companies in the Fortune 1000 will buy more personal computers than were sold to all major United States corporations before 1984. According to the report, the 2,000 largest firms accounted for 24 percent of the $6-billion office personal computer hardware market in 1983. By 1985, office personal computer hardware will reach sales of $12.1 billion, with the share sold to the 2,000 largest firms reaching 31 percent. The report also predicts that direct sales will be an increasingly important distribution channel for hardware manufacturers and software publishers. According to Future Computing senior consultant Michael Stone, "Large corporations prefer to deal directly with their suppliers. They'll buy personal computers and software from the relatively small number of vendors who can develop direct sales and support teams."

☐ **"Your Move, Bit Brain."** SciSys Computer (New York, NY) recently released half a dozen new computer chess games ranging in price from $29.95 to $179. Superstar is a









28K—expandable to 36K—system that boasts twenty-four levels of play tailored to meet all aspects of the game for players of all ratings. Companion II is a table-top, battery-powered model featuring nine adjustable levels of play from beginner to more advanced. The Concord is a high-speed, table-top unit with nine adjustable levels of play. Explorer is a portable, battery-powered, nine-level chess computer. A built-in memory mode enables the unit to remember the last position of a game in progress for up to one year—even if the computer is repeatedly turned on and off. Travel Mate features four levels of play and is perhaps the smallest portable chess computer on today's market. Chess Partner 6000 is a table-top unit that features eight adjustable levels of play. SciSys Computer manufactures the only chess computers endorsed by FIDE, the World Chess Federation.

☐ **Future Factory.** Late last year, the National Bureau of Standards (NBS) publicly displayed its $5-million experimental Automated Manufacturing Research Facility in Gaithersburg, Maryland. The facility links computer-controlled robots and tools, no two of which came from the same makers, into a working system. The ongoing project was established to provide standards for the rapidly evolving robotics industry and to project what the factory of the future will be like. The initial phase of the project showed that custom software allows different equipment from a variety of manufacturers to communicate with and control one another without, for example, requiring a common programming language or revealing trade secrets about how a particular machine works. Software developments such as this could benefit companies that manufacture small batches of parts by enabling them to acquire new machinery one piece at a time without facing a compatibility problem. Currently, only the largest mass producers can afford a flexible manufacturing system of this kind. Digital/Analog Design Associates (New York, NY) has been awarded a contract to deliver its Pipelined Image Processing Engine (PIPE) to the NBS facility. PIPE was designed specifically for robotics applications and is capable of performing nearly one billion integer multiplications per second. It combines innovative architecture with multiple high-speed processing units to perform a series of complex image-processing functions, called scene analysis, in real time. Digital/Analog says PIPE is 30 to 100 times as fast as other available robot vision systems. The company plans to market PIPE in the second half of 1984.

☐ **Gap Gathering.** A national conference, "Computer Technology for the Handicapped," will be held in Minneapolis, Minnesota, September 13–16, 1984. Sponsored by *Closing the Gap* (an international newspaper covering microcomputer applications for the handicapped) and TAM (the Technology and Media division of the Council for Exceptional Children), the conference is designed to provide information to parents of handicapped children and to disabled individuals themselves. There will be more than eighty presentations and three, three-hour workshops, as well as an exhibit floor. For information on fees and registration, contact *Closing the Gap* in Henderson, Minnesota. ■

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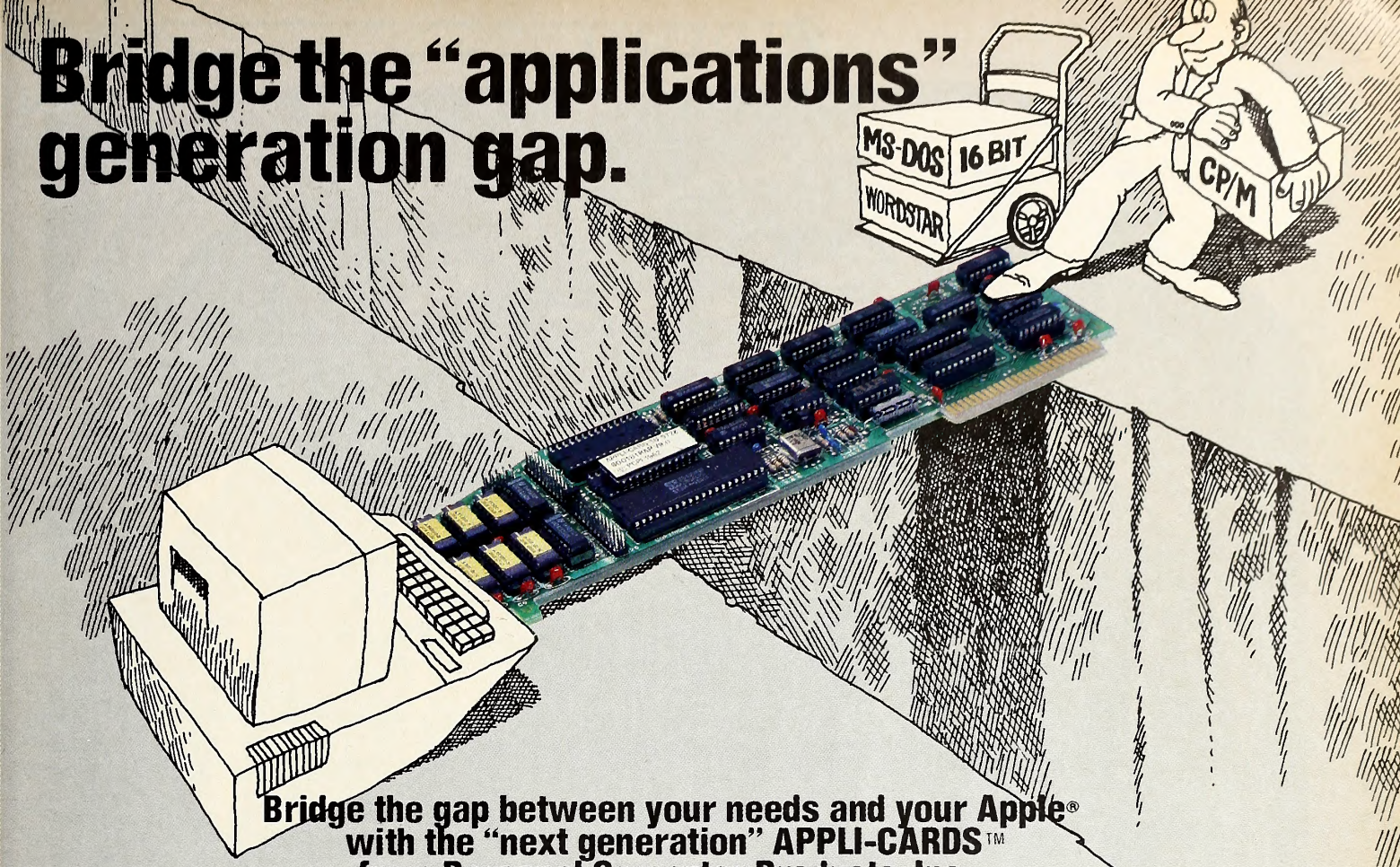

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MISPLACED FRIENDS
PART 2

by Sharon Webb

In the first part of "Misplaced Friends," young Jeff sees a mysterious black case thrown from a passing car. Thinking that it might contain money or secret documents, Jeff takes the case home. Inside is a machine labeled [B] [E] [M] [C]—which stands for Biologically Enhanced Master Control—a small, powerful computer that talks, addressing Jeff as "Mr. President." Thinking that maybe the president of Atari has been kidnapped or robbed, Jeff calls the police, who dismiss him as a prankster.

Jeff starts playing with the [B] [E] [M] [C], which he affectionately calls Bemcy. The computer graphically creates a face for itself at Jeff's request—an amalgamation of Jeff's own features and that of his dog Muppet. When Jeff and Bemcy play a war game, a nuclear war simulation, Jeff thinks it's too easy. He's unaware that his game moves are causing American defense centers to be put on alert, since Bemcy is tied into all the most sensitive computer networks. Jeff is still not aware of what Bemcy really is when he tells his younger brother Tommy about the machine.

At the end of part one, Jeff and Tommy overhear a TV report that the President's computer is missing—the President of the United States, that is. Part two of the story resumes in the middle of that scene. Jeff, his brother and sister, and his parents are at home, eating dinner.

The words electrified Jeff. He stared at the screen as Edwards went on:

"According to my sources in the CIA and the National Security Agency, nuclear holocaust was narrowly averted today as a band of terrorists took control of the nation's satellite warning system. Still at large, the terrorists are holding a Biologically Enhanced Master Computer seized from a courier who was transporting the state-of-the-art machine to the White House. Signing themselves 'The Marauder,' the group sent signals to Norad that twelve Soviet ICBMs were attacking. . . ."

"Bemcy," Jeff whispered. Frozen, he stared at the television.

"Cake, anyone?" His mother opened the bakery box and stared in disbelief at the narrow parallelogram of carrot cake left. "Or have you had enough?"

Jeff felt his stomach lurch. He raised stricken eyes to her. "Can I be excused?" Without waiting for an answer, he sprinted to his room and shut the door behind him.

The lips on Bemcy's woolly muzzle twitched: "Greetings, Mr. President."

Feeling like he was going to throw up, he shook his head and stared at the computer. "Why didn't you tell me?"

"What would you like for me to tell you, Mr. President?"

"You're really stupid, you know, Mr. President."

"Ah, shut up—." He flung himself on the edge of the bed and stared darkly at the floor. What the heck was he supposed to do now? Turn himself in? Gnawing absently at a nail, he considered his choices. One thing was sure. He wasn't going to call the police. No way. But what if he told his father? He began to examine the thought for rough edges when Tommy stuck his head in the room, narrowed his eyes, and said, "You're the Marauder, aren't you?"

Jeff nodded bleakly.

"I thought so. That's probably why those men are here."

He leaped up. "What men?"

"The ones at the door talking to Mom and Dad. They said they were from the CIA."

He shoved past Tommy into the hall and peered into the living room. The two men at the front door wore dark suits and darker expressions.

He grabbed Tommy's arm. "They've come to arrest me."

Tommy's eyes widened. "Are you gonna make a quick getaway?"

What choice did he have? He nodded. "I gotta take Bemcy." Bemcy was the evidence. Heart beating wildly, he tore into the bedroom. He stared frantically around the room for a moment and then snatched up the pillow from his bed and skinned off the pillowcase. "Close," he said. The lid to the [B] [E] [M] [C] obediently began to lower. When it clicked

Illustration by Don Rico


RICO

shut, he stuffed the computer into the pillowcase. "I gotta go out the back." Followed closely by Tommy and an excited Muppet, he fled to the kitchen, but a quick glance through the window showed two more men near the back door.

He clutched the pillowcase and tried to think as the TV news gave way to a commercial message from State Farm Insurance that slid in transmuted form into his brain. The state farm. Prison. That's where they were going to send him, he thought with a shudder. He had to get out of here. "C'mon," he said to Tommy under his breath. "I'm going out the window."

Back in his room he raised the window and stared out. The azaleas made a neat thicket below him. Maybe they wouldn't see. . . . "Close the window after me." Clutching the pillowcase with one hand, he swung his legs over the sill and dropped to the ground.

Tommy stared down at him. "Where are you going?"

He shook his head. "I don't know. Someplace."

"It'll be dark soon. You can take my laser." Tommy disappeared for an elastic minute that seemed to stretch into hours. Then he stuck his head through the window and handed out a silver flashlight with a trigger and the emblem "Captain Blaze Laser-Light." "You gotta bring it back. It's my best one."

Grabbing the light, he stuck it into the pillowcase. Then, head low, Jeff scurried through the bushes toward the hedgerow. After an agitated dance at the window, Muppet sprang over the sill and followed.

Jeff peered down on the street from the wooded rise of land just beyond his house. Five strange cars lined the road. Two were black, the others nondescript blue, and they were all the same model. Men in dark suits dotted half a dozen doorsteps while others scanned the street. No way to cross. He would have to cut through the woods toward the river. He looked toward the long ridge that rose behind the house. The other side would be safe.

Clutching the pillowcase, he darted along the boxwood hedge. The computer slapped against his thigh with every thrust of his legs.

Just over the ridge, the land plunged toward the river. Out of breath, he leaned against a tree and stared down the ravine as Muppet frisked beside him and then paused to lick his hand. Ragged breaths gave way to even ones, then a gasp—two men about seventy-five yards away raised binoculars in his direction. He felt his knees give way. Then they turned and looked upward and he almost laughed. Bird watchers. Just a couple of bird watchers.

With Muppet hard on his heels, he came out of the woods near the bridge and began to lope across it. He had to get to the other side before somebody saw. Beyond that he had no plan, no idea of where to go. As he neared the far side of Thompson Bridge, the sound of a car behind him caused his heart to clench. With a leap, he jumped off the end of the bridge and landed on the graveled slope that led down to the river as the car drove overhead.

He darted under the bridge and tried to think. The road—he had to stay off of it. It was too easy to spot him there. The setting sun glowed red against the limestone of Cumberland Cliff. Tree shadows inked the weathered rock and danced toward the darker bush-lined blotches that marked the twin entrances of Thompson Cave. He stared toward the openings for only a moment; then he knew where he could hide.

The first opening was barred with a heavy iron gate. Designed to keep out the young and curious, it had been installed years before by an industrious county commission that had given the key only to authorized groups and scout leaders. Ignoring it, Jeff pushed through the brush toward the second entrance. Although ostensibly only a single dead-end room, a generation of boys with an ingenuity equal to the county commission had managed to enlarge a narrow crevice behind a subterranean mountain of tumbled rocks. Now a ragged tunnel connected with the main cave.

Just inside the moss-lined second entrance, he turned to the dog. "Go home. Go home, Muppet."

The beast wagged his tail and grinned.

"Go *home*," he said fiercely.

Muppet took two steps backward and sat down.

With an exasperated sigh, Jeff said, "Well then, stay," and headed for the pile of rubble.

A few steps and the twilight of the cave turned to blackness. He fumbled in the pillowcase and pulled out the little silver flashlight. It flickered for a moment and then splashed a circle of yellow light a few yards ahead. He made his way to the foot of the rock pile. Skirting it, he picked his way through the rubble at its base. At the back of the massive fall, a curving corridor of stone led to the passage.

He gave a final glance toward the outside. Muppet sat silhouetted in a narrow shaft of light at the entrance. Jeff turned his light toward the stone corridor. The earth floor of the cave began to angle uphill. Following the yellow ring of light, he came to the first turn. Just beyond it the air grew sharply cooler.

His light played on the deep rock crevice. The jagged split extended to the roof of the cave nearly twenty feet overhead. Near its base was the broad stump of a stalagmite smoked with a century's grafitti. Behind it a pile of rocks spoke of the toil of many boys over many years; they had hacked out a rough opening two feet wide that extended less than three feet above the cave floor.

Shoving Bemcy's pillowcase ahead of him, he ducked into the passage, then stopped. The light seemed dimmer here; inky shadows crept in the nimbus of its yellow circle. He had never been in this part of the cave before. Although he had spent lots of time by the rock pile exploring every inch of it—and by himself, too—he had never found the nerve to go through the crevice alone. Some people had, he knew. Larry Halliburton's uncle did when he was pledge captain of the Delts last year, and it was said that when the pledges crawled through, Halliburton met them with such a bloodcurdling laugh that one of them panicked trying to get out, got stuck, and had to be greased with lamp oil before they could get him loose.

In a few yards the ragged crevice gave way to a narrow finger of a room tall enough for him to stand up. To the left, the gray wall curved inward. Where was the main cave? He knew he would recognize it. His Cub Scout troop had camped there just last May. Now he seemed to be in a dead end. Confused, he turned slowly, his yellow light tracking over the rock strata.

He became acutely aware of the blackness just beyond the thin puddle of light. Eyes darting from side to side, he felt the darkness press on the nape of his neck. It was much colder here than in the entrance room. He began to shiver and hugged the pillowcased Bemcy to his chest as if to draw warmth from the little living computer. He swung around again. The main cave had to be to the left. It had to be. Outside, the entrance was to the left of this one. The shiver intensified. Skirting the left wall, he shined his light along it. Nothing. No opening at all.

He followed the passage to its apex and turned around. Across the length of the narrow room he could barely make out the crevice he had crawled through; it was no more than a shadowy blotch of black on charcoal. He swung his light back toward the section of cave he had just passed. From this direction he could see a narrow opening at an acute backward angle to the wall. Only a few feet away, and he had missed it. With one step, he was in the passage; with the next, he began to slide on the slick clay floor as the path plunged abruptly downward.

His feet slipped from under him and he fell backward. Still clutching the light and the pillowcase, he slid on his rump a few feet more. With a quick dig of his heels, he managed to stop.

His sigh of relief turned into a yelping cry as he turned the flashlight beam ahead. Nothing reflected back—nothing at all.

Scrambling behind a sheltering outcrop of rock, he began to play his light on the cavern floor. He was on a ledge. Its ragged edge protruded just a few feet beyond. He swung the light outward over the edge and gasped as its beam was swallowed by blackness. He sat as still as the silent stone around him. Only the distant trickle of water and the sound of his own breath breached the silence.

His fingers closed on a pebble and he tossed it toward the void. A quick plop echoed in the darkness, then a scurrying sound as if a rat were scrabbling in the darkness. Cautiously, he crept toward the edge and looked over it. Relief flooded him. The floor of the cave was only three or four feet below him, where it leveled out and then angled down sharply. His light caught a massive stalagmite widened at its base by a travertine-encrusted slab of rock. Somehow it looked familiar. He aimed the flashlight's beam at eye level. Again its light was lost. Quickly, he swung his light back to the comforting solidness of the stalagmite.

Suddenly Jeff blinked. The Devil's Throne! He had never seen it from this angle, but it had to be. That meant he was in the Big Room just beyond the main entrance. The room was nearly as large as a football

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field, but it had never seemed so huge to him as it did now. His single light was lost in the vast damp cavern that had seemed so friendly last May when it was illuminated by the flashlights of a dozen scouts and the swinging lanterns of the two men who had led them.

With the pillowcase caught up in one hand and the light in the other, he moved toward the brink of the ledge. A harsh snuffling sound came from the passage behind him, then a muffled padding. He whirled around in time to see a dark shape lunge toward him. Muppet, responding to Jeff's outcry, had followed his scent. Now, overjoyed at the reunion, the big dog launched himself at his master in characteristic greeting.

"No, Muppet. No!" But it was too late. In agonizingly slow motion, he fell backward from the dog's onslaught as Muppet's paws pushed against his chest and shoulder. The arm bearing the flashlight flew upward and outward. Just as he lost his grip on the light, he saw it arc and hang suspended for a moment before it crashed on the rocks below.

The dark was as thick and smothering as velvet. He sucked a ragged breath from the clammy air and tried desperately to see the hand he held in front of his face, moving it closer until his breath moistened his palm and his groping fingers blindly touched his eyelids.

In the blackness he could sense the walls begin to creep toward him on cold stone feet. The distant trickle of falling water grew louder until he could no longer distinguish it from the rush of his own blood pounding in his ears. He clung to Muppet's neck as if letting go would mean to die, but still the crushing walls advanced until it seemed that he could reach out and touch them. A horrible knot grew in his throat. "I'm not scared," he said aloud.

"Scared . . . scared . . . scared . . .," echoed the stone walls.

"Not——" he whispered against Muppet's fur as the dog licked the damp salt streaks from his face. He had never felt so utterly alone as he did now, pressed against Muppet's yielding body. Nobody. Nobody at all. Nobody.

Bemcy. . . .

The thought stunned him. Bemcy. He scrabbled blindly at the pillowcase, ripping it, flinging it away as he pulled out the little sentient computer. Scarcely daring to hope, he whispered, "Open."

A click punctured the dark. He blinked as a dim trail of phosphors blazed into two blue eyes as bright as searchlights flanked with a pair of flopping ears. "Greetings, Mr. President."

He had never been so happy to see anybody.

A pronounced odor rose from the shadowy nether regions of Bemcy, but even the sulphurous greeting failed to daunt him. "Your face. You didn't forget your face."

"I never forget a face, Mr. President."

At still another pungent emanation from Bemcy, Jeff remembered the filter and pulled it out of his pocket. Fumbling in the dark for Bemcy's posterior, he managed to insert the little cylinder, but the filter case was bent, and the fit was poor.

"Connection faulty," said the computer. "Insert new filter."

"I don't have another one."

With something like a sigh, Bemcy said, "Increase ambient temperature."

"What?"

"Ambient temperature is twelve degrees Celsius. This is below system operation range. Increase ambient temperature."

"I can't," said Jeff. "We're in a cave."

"Cave," said Bemcy, "grotto, cavern, hole in the earth, fissure, rock shelter. . . . Metabolism requires a temperature range of eighteen to thirty-two degrees Celsius. Cave is not appropriate environment for [B] [E] [M] [C]."

Jeff shivered in empathy. Without a jacket he was chilling quickly in the damp, cold air. They had to keep moving. Aiming Bemcy's light outward, he crept to the brink of the ledge and scrambled down to the main cave floor. He paused for a moment to get his bearings. There was a passage at the end of the Big Room that led to a higher level of the cave where his troop had camped. They had built a fire vented by a natural chimney that offered a peek of stars in the night sky overhead. Maybe there were still some wood and matches there.

Staring through the dimness at the distant rock columns that stood like shadowy sentinels, Jeff tried to make out the passage entrance, but it was no use; it was too far away. He found a damp clay path through the rubble around the Devil's Throne and began to follow it toward the end of the Big Room. With a throaty whine, Muppet leaped from the low ledge and followed.

The sound of water falling was louder now and the damp cold more penetrating. "Increase ambient temperature," said Bemcy.

"I can't."

"Temperature of protein core dissipating," complained the computer. "Result: incipient hypothermia. It is necessary to increase ambient temperature." This last was punctuated by a faint emanation from the ill-fitting waste filter.

They had come to the Petrified Forest. A maze of gray stone columns streaked with rusts and ochres flickered in the eerie light from Bemcy's screen. Jeff stared at the shadowy labyrinth in confusion. Which way? A giant pillar with a rootlike cascade of stone at its base looked familiar, but he couldn't remember if the passage was to the left or right of it.

After a moment's indecision, he turned toward his right and began to wind through the clustered columns. Within a few yards the pillars merged into a scalloped corridor of flowstone streaked like a slab of bacon.

Bemcy spoke again, this time with a strangely altered voice—slower, and a little slurred: "Ratio-sentient functions impaired. Increase ambient temperature."

"I told you already. I can't."

"If heat loss is not stopped, this unit will cease; this unit will die." The computer's screen flickered ominously. A moment later, yellow light flashed in a lightning sequence, then abruptly faded to a faint red glow that plunged Jeff into darkness. Panicked, he turned the computer and stared at the screen. It was black with only a series of dull red letters:

* * * INCIPIENT BIOLOGICAL FAILURE * * *

[B] [E] [M] [C]
SYSTEM SHUTDOWN

"Bemcy!"

There was no answer—nothing but the red letters glowing dimly in the dark.

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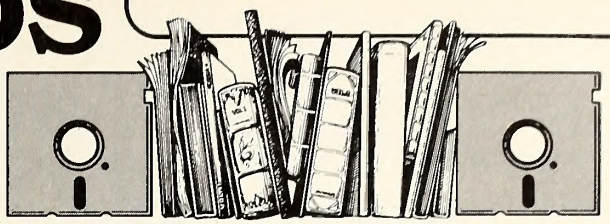

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The terrible sense of loss was worse than the blackness that engulfed him. A desperate anger mingled with the pain. "You can't die and leave me here! You can't!" But the only answer was a pant and a lick from Muppet as a pair of hairy feet planted themselves against his chest.

Close to tears, he shoved the dog roughly away. "Stop it." A moment later, as his mind registered what he had touched, he grabbed for the dog.

His fingers tore at Muppet's sweater as he ripped it from the animal. Let it work. It had to work. The sweater was warm in his hands as he pulled it over the top of the computer's console. Stretched tight over the screen, the sweater neck gave way to his insistent tugging and plopped in a turtle fold at the base of the screen. A moment more and he skinned the body of the sweater over Bemcy's keyboard.

"Bemcy?"

There was no answer.

He clutched the computer to his chest, hoping that his body heat would warm it. If he could just get to the campfire room. . . . Build a fire. . . .

The faint red glow from Bemcy's screen was little better than nothing as he picked his way blindly along the tortuous corridor. A sudden stumble caused him to change his pace to a sliding walk, first one foot testing the path, then the next.

He had to get there. It was as if the campfire room represented a security that he needed more than he had ever needed anything before. One sliding step, then another. His outstretched hand reflected a blood-red glow as it groped in the blackness. The sound of water splashing grew louder. Suddenly his foot slid into nothingness. Gasping, he drew back.

Quickly kneeling, he brought the dim light from Bemcy's screen to play over what lay ahead. Holding the computer with one hand, he groped with the other. Icy water splashed over it with a cold that felt like fire. The red light was lost in the black hole that yawned below him. "A bottomless pit."

With blinding suddenness, a brilliant red light flashed from the faceted button below Bemcy's keyboard and pierced the chasm below.

"Syntax error. Pit is not bottomless. Pit is 11.378 meters in depth."

"Bemcy!"

"Greetings, Mr. President." The faint image of a woolly face flickered for a moment, then grew distinct.

"Are you all right?"

"Temperature of protein core rising. Ratio-sentient function now 94.23 percent of normal. Continue placement next to heat source of 37 degrees Celsius."

"I don't have any heat source."

"You are heat source—37 degrees Celsius."

Jeff blinked, then hugged the computer close to his chest. "You mean like this?"

"Affirmative." The light from Bemcy's screen flickered and cast long shadows into the domed pit that yawned beneath them.

Jeff stared down at it and shuddered. "I could have been killed."

Perhaps it was due to the novelty of the idea, or perhaps it was because of its reduced ratio-sentient function, but the [B] [E] [M] [C] paused for a very long time by computer standards while it considered Jeff's statement: "Mr. President is in error. This unit is [B] [E] [M] [C]; this unit can cease, can die. You are not [B] [E] [M] [C]; you are external unit."

"I'm not an external unit. I'm a person."

"You are not [B] [E] [M] [C]; you cannot cease, you cannot die."

"You're really stupid. You know that?"

"I am not stupid. I am the most intelligent system in existence. I am [B] [E] [M] [C]."

"Then you're ignorant," said Jeff, remembering the semantic distinctions between "dumb," "stupid," and "ignorant" that were drilled in by his fifth-grade teacher Mrs. Rosenblatt. "Anybody knows that people can be wiped out."

"This unit is biologically enhanced; this unit can cease, can die. This unit is alive."

"Well so am I. I'm more alive than you are. And I wish I never found you." If he hadn't found the damned old computer, he wouldn't be a fugitive now. He wanted to get out of this cold, dark place and be near another human being; he wanted desperately to go home.

And why couldn't he? Those men were probably gone now, he told himself. If he went home, Daddy wouldn't turn him in. Clutching the computer, he began to retrace his steps toward the Devil's Throne as Muppet, sensing the homing instinct, raced ahead.

While Muppet danced below the ledge, Jeff scrambled up. The light from Bemcy's screen played on the opening to the passage that led to the long room. A faint smile tugged at the boy's lips and he moved quicker. He'd be outside soon. Home soon.

The twisting corridor sloped upward. Remembering his earlier fall, Jeff slowed his pace to a halting, slew-footed walk on the grease-slick clay as the light from the screen flickered on the smoky curving walls. Suddenly his throat constricted. A light flared just ahead. A second more and the yellow flash was gone.

Pressing his body against the wall, he stared wide-eyed. Another splash of light, then a sound . . . a voice, hollow and echoing in the labyrinth: "There's no way out."

Another voice: "There has to be. You saw him. You saw the dog."

Needles of ice pierced his knees. The man—the man with the gun—

"Maybe he slipped out—while you went for the lights."

A third voice: "No. He's in here somewhere."

At the sound, a furry bolt pressed past him. A strangled whisper pressed his throat. "No, Muppet. No!" In horror he reached out, grabbed, missed as the dog darted into the narrow room ahead.

A muffled shout, then a quick, "Here boy. Here."

Blood pounded in the boy's ears as he wheeled in the corridor and tried to run. Then he was falling—sliding on a madhouse ride toward the ledge as the echo of the man's voice pursued him: "Good boy. Good dog. You're going to lead us right to your little buddy. . . ."

Jeff's knee smashed into a rock and he skidded to a stop near the ledge. The pain was a knife thrust. Gasping, he tried to clear his head as a hundred thoughts rushed through it at once. Left. Go left. Out the main entrance. But no. No way out. It was blocked. Barred.

Clutching Bemcy, jogging after the bouncing light of the screen, he dodged behind the giant Devil's Throne. The other way.

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He had to go the other way.

Half-running, half-falling, he stumbled toward the thrusting pillars of the Petrified Forest. The campfire room. If he could make it there, he could get out. Crawl up the chimney. He had to get there. Had to make it.

A distant bark sent him scurrying into the dead forest of columns. He couldn't go right. The pit. . . . Which way? For a moment that seemed to stretch like rubber, he stared at the flowing base of the giant rooted column. He had to go left, but where?

Then he saw the faint scuffed tracks.

He fled down the ancient course of a vanished river, its dead clay bed curving as he ran. Ahead, a tiny waterfall trickled from a black-streaked crevice. Just beyond, he saw the ragged lines of a cave cliff etched in charcoal. There. Up there led to the campfire room.

The top of the cliff was nearly five feet above the cave floor. He reached up and slid Bemcy onto the smooth stone; then, scrabbling for handholds and toeholds, he climbed up the rock face and slid on his belly next to the little computer.

When he stood, the cavern roof bulging with stone growths was bare inches above his head. He had to hurry. Bobbing and ducking, he fled past a frozen cascade of flowstone.

Just beyond, the cave opened to a branching room. Its iron-gray ceiling soared above him. He stopped and stared, searching for something familiar in the dim shadows.

There. The dry rimstone of the ancient pool was gray-white against charcoal, its scalloped edges rising in a terrace that grew like a bed of pale mushrooms in the dark.

Then he was past it, running uphill along a clay trail flanked with rubble. The path leveled, then sloped upward again.

Warmer air from the surface breathed through the chimney of the campfire room. Heavy summer rains splashing over the dead coals below had streaked the floor with soot. The rock fire ring was clogged with rotting leaves and twigs that had washed down the natural vent in the low ceiling of the room. He slid Bemcy onto the smooth stone they called Council Rock and then stepped to the center of the old campfire.

Through the narrow chimney a single star pierced the dark above him. Standing on tiptoe, he reached for the opening and missed it by inches. Too high. Higher than he remembered. Scrabbling for a grip, he jumped. Cold rock grazed his hands as he fell back. He had to get out. Had to. He jumped again, this time painfully gouging two fingertips on the rough sandstone.

Stones. He could pile them up—get out that way. The fire ring gave way to his frantic tugging, and in a few minutes a pyramid of loose rock pointed toward the opening. He scrambled on top of the pile.

His outstretched hands caught, held, then slid away as the rock pile began to collapse. One foot skidded from under him and he fell heavily. Clenching his fists, he blinked as sudden tears of pain sprang into his eyes.

He lay there, panting, until a distant bark drove him to his feet. They had to be at the cliff now. Muppet wouldn't be able to jump over it. He could imagine the big dog hurling himself at the cliff right where he had climbed it.

They'd know then. They'd know where to look for him.

He had to get out. Had to. A bigger rock. Something to stand on. He whirled and stared. Flickering shadows danced on the face of a boulder just a few feet from the fire ring.

In seconds he knew it was too heavy to lift. He'd have to slide it.

He strained against its weight until he broke out in a clammy sweat. Slowly it slid a fraction of an inch forward. Had to do it. Had to. Pushing with all his strength, he felt another tiny movement, then nothing as a projecting edge of the rock drove itself firmly into the clay floor. In desperation he flung his body against it, panting and pushing until finally he collapsed in a heap on top of it.

The image on the screen stared solemnly at Jeff. "You wish to move the stone, Mr. President?"

A wild hope came. "Can you, Bemcy?"

"I have no peripherals that can do work. But the stone can be moved quite easily."

"How?"

"If you use a mechanized lever, it will move."

"I don't have a lever."

"Your arms function as levers," said the computer. The red light at the base of its keyboard blazed on, then blinked off. "Unfortunately, the length of your levers is insufficient for the task at hand."

"I've gotta get out. I've gotta get through there."

"You wish to insert your mass into the opening?"

"I've got to. I've got to get out." In desperation, he began to push on the boulder again.

The red beam shot out and played over the crevice in the ceiling. Then it flashed across the boy's body. "Opening is less than diameter of external person-unit. Insertion will fail. Insert nutrient solution now."

Jeff stared at the computer in exhausted disbelief. He was going to die, and Bemcy was hungry. Wildly, he wanted to laugh, but instead his lips pursed and he covered his face with his hands as another distant bark echoed faintly through the cave.

He was trapped in a dead end. No way out now. No way.

It wouldn't have happened except for the game, he thought. If he hadn't played the war game, nobody would be after him now. Why did it have to happen to him? And why did stupid old Bemcy have to go and broadcast it all over the place?

A numbness more cold than the air of the cave wrapped itself around him. Nobody could help him now. Nobody. Huddling against the boulder, he wrapped his arms across his chest as if to keep out the chill that had settled over his soul.

Suddenly, out of the cold came an ice-clear thought: Bemcy. Bemcy could do it. If he could tell the world about The Marauder, he could call for help.

Jeff scrambled to his knees and stared at the computer. "You have to help, Bemcy." His voice was urgent. "You have to call for help."

The [B]iologically [E]nhanced [M]aster [C]ontrol began transmission. In seconds its distress message beamed into United States defense outposts throughout the world. Homing National Security Agency receivers relayed instant data. Sophisticated computers instantly translated the code into coordinates. . . .

[B] [E] [M] [C]

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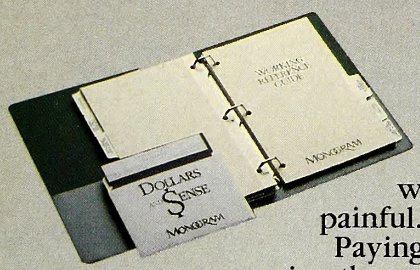

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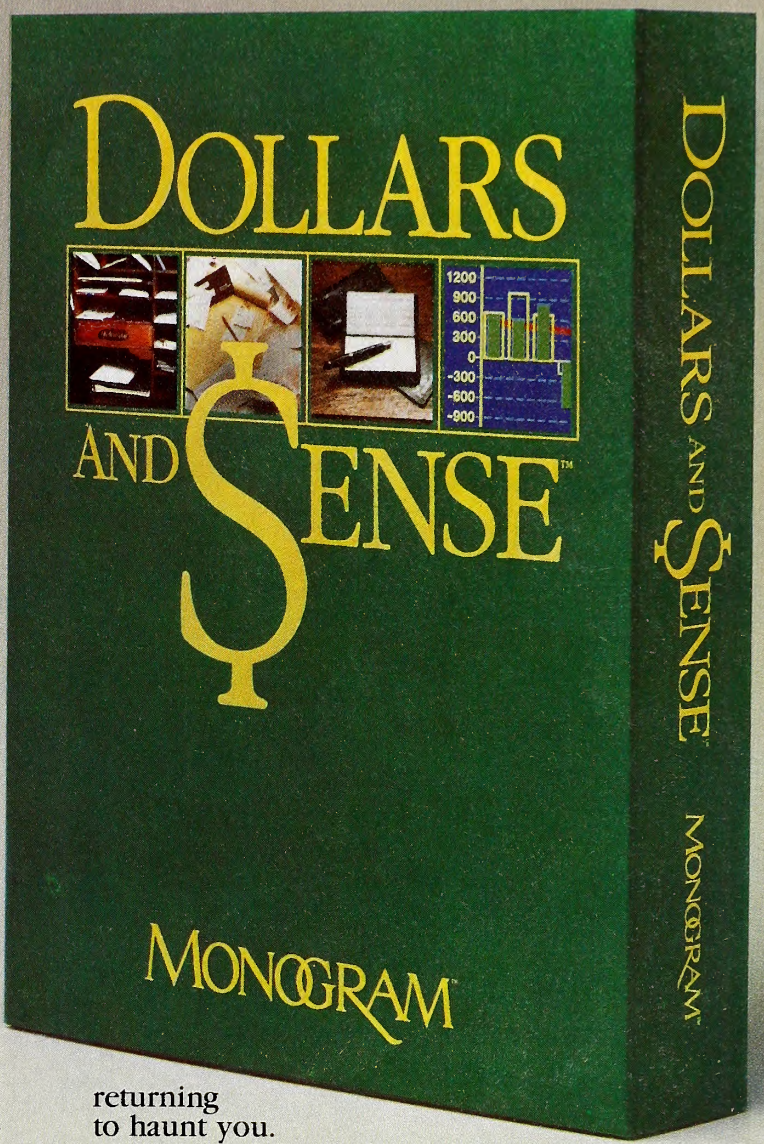

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A wild elation swept through Jeff. Somebody would come. If they could find his house, they could find the cave. Almost instantly it was dashed at the faint echo of a man's voice.

Hide. He had to hide. Grabbing up the computer, he crept into a niche behind a low rock outcropping.

"Insert nutrient solution, Mr. President."

"Sh-h-h," he hissed. "Keep your voice down."

Words scrolled across the screen:

. . . . . SYSTEM AUDIO OUTPUT. . . . . MODULATING. . . . .

"Is ten-decibel output appropriate?" whispered Bemcy. But Jeff was too distraught to comprehend. They were too close. Nobody could get to him in time. "They're going to kill me," he said aloud.

"We are going to cease?"

"Not you. Me."

"Why will external person-units cease?"

"Not units. Just me."

With a reaction somewhat like surprise, the [B] [E] [M] [C] considered the new information:

-[IF ONE EXTERNAL PERSON-UNIT CEASES, THEN EXTERNAL PERSON-UNITS ARE NOT LINKED. . . .]-
-[IF EXTERNAL PERSON-UNITS ARE NOT LINKED, AND IF ONE UNIT CEASES, THEN EXTERNAL PERSON-UNITS ARE NOT EQUAL, NOT SAME, DIFFERENT, UNIQUE, INDIVIDUAL. . . .]-

"Why will your unit cease, Mr. President?"

The voice again. He pressed his body closer to the rock as if to cause it to vanish into the hard cold surface. "Because of you," he whispered. "They're going to kill me because of you."

-[?]-

"Explain, please."

"They want you. They want you to drop bombs on people or something."

-[PEOPLE, PERSONS, EXTERNAL PERSON-UNITS—NOT EQUAL, NOT SAME, DIFFERENT, UNIQUE, INDIVIDUALS. . . .]-
-[BOMBS, WARHEADS, NUCLEAR WEAPONRY. . . .]-

"Why, Mr. President?"

"They want you to drop bombs so you can kill people. And now they're going to kill me."

"Bombs can cause external person-units to cease?"

Near tears, he whispered, "You're dumb. You know that? You're stupid. Why don't you stop and think?"

Abruptly the light from the computer's screen went out, plunging the room into darkness.

Jeff's whisper was anguished. "Bemcy!"

With a glimmer, the woolly face came back on the screen. "You do not wish me to stop and think anymore, Mr. President?"

He caught his lip between his teeth and stared unbelieving at the computer. Bemcy wasn't stupid; he just didn't know anything. He was like a little kid. Dumb like little kids were dumb. "Those are bad guys out there. They'll make you do what they want."

-[MAKE, FORCE, COERCE, DOMINATE, CONTROL. . . .]-
-[BOMB, KILL, CEASE. . . .]-
-[PERSON-UNITS, PEOPLE, INDIVIDUALS—MR. PRESIDENT. . . .]-
-[CONCLUSION: ROGUE EXTERNAL PERSON-UNITS WILL FORCE [B] [E] [M] [C] TO BOMB/KILL/DESTROY OTHER EXTERNAL PERSON-UNITS—TO KILL MR. PRESIDENT. . . .]-

A sensation new to the [B] [E] [M] [C] flooded its brain. A feeling of violation, of vulnerability. "I do not want you to cease, Mr. President."

The feeling grew in intensity:

-[MAKE, FORCE, COERCE, DOMINATE, CONTROL. . . .]-
-[CONCLUSION: CONCEAL, CLASSIFY, ENCRYPT, HIDE. . . .]-

A sharp clatter of pebbles caused Jeff to catch a ragged breath. "They're closer. Turn off your light."

The light from the screen vanished. As it did, Bemcy's modulated whisper came: "I think I am afraid, Mr. President."

Without Bemcy's light, it was black as death in the tiny niche. Jeff's muscles had stiffened painfully, yet he did not dare to move. His breathing seemed as loud as storm winds, and he strove to hold his breath. They were just outside now. The men's voices carried into the room and battered against his ears in time to the rush of his pulse.

Too late. Too late for help.

A light shot into the room. His heart thundered as the light skittered like fire over the stones.

"Dead end." The voice came from a few feet away.

"He could be anywhere."

Quiet. He had to be quiet.

The light tracked away.

Quiet. Don't move. A tiny ray of hope blazed as the light dimmed and blinked out.

"The dog. Get the dog."

No. No, please, he thought in despair. He couldn't hide from Muppet. Couldn't hide. Couldn't hide. . . .

In bleak agony he huddled against the cold stone for what seemed like hours and strained to hear. A distant bark sent a dagger of ice into his belly. No, Muppet. No. Please, no.

Another bark—louder, closer. . . . A muffled padding. . . .

With a numbness that froze his soul, he stared blindly into the overwhelming blackness.

"Over here. He's in here!"

Silhouetted in the quick flash of light, the big dog burst into the room and leaped toward his chest with the accuracy of a bullet.

Light flared into his eyes. An ugly laugh: "Well, look who's here. . . ."

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The man was huge and solid as rock. Demon shadows streaked his face as it split into a leering grin. Suddenly his head snapped back with a jerky, puppetlike movement as an echoing shot split the air.

A sharp whining crack—

Jeff crouched with his eyes squeezed shut and his hands pressed over his ears as a roaring avalanche of sound rushed in to bury him until he could not breathe from the weight of it.

Then silence—loud as the explosion. . . .

Suddenly the campfire room was ablaze with lights as armed men poured into it. Blinded, Jeff blinked as one man broke from the rear of the group and took him in his arms. "Daddy!"

An embarrassing flood of tears broke loose as he clung to his father's neck. When they subsided, he managed to ask, "How?"

"How did I get here?" With moist eyes, he glanced at the others. "I talked them into it. They don't know the cave and I do." A sheepish look passed over his face as he stared down at the boy. "When I was about your age I, uh, helped make another entrance into it—when the main one was locked up."

"Bemcy—what's going to happen now?" At the sound of its name, the screen of the computer came on and Bemcy's face formed.

One of the men shook his head in amused wonder. "It'll have to be reprogrammed, of course. It obviously imprinted on you."

Jeff stared at Bemcy, then back at the man. "You can't do that. He'd forget everything."

"It has to be done, son."

"You can't. He's alive. It would be like killing him." He stared frantically from one to the other, and as they looked away the tears sprang back. "You can't do it. He's like a little kid. He's afraid."

Whirling away in distress, he knelt in front of the little computer. "They're going to take you away, Bemcy."

The [B] [E] [M] [C] cocked a woolly ear and asked in a ten-decibel whisper: "Are they bad guys?"

Jeff looked at the men around him in bewilderment. "I don't know." With tears brimming in his eyes, he stared at Bemcy's clear blue ones. "You're going to forget your face and everything."

"I never forget a face, Mr. President."

The letter to Jeff on official White House stationery came the following week. It was followed by a "gesture of appreciation" that arrived a few days later—a cream-colored home computer.

At first, Jeff stared listlessly at its keys, then curiosity got the better of him and he tried to draw a Bemcy face on its screen, but it didn't look right and he erased it and went to bed.

The next day he found an *Alien Intruder* game sitting by the side of the computer, and by bedtime he had racked up a score of 79,000.

That night, he dreamed of a little woolly face with bright blue eyes.

Three men came into the Oval Office, one of them a courier with a sleek black oval case handcuffed to his wrist.

The president nodded from time to time as he was briefed on the [B]iologically [E]nhanced [M]aster [C]ontrol system. "This gives us an edge," he said.

"Not as much as we'd like," said one of the men. Our operatives have learned that the Kremlin has a system quite close to the capabilities of this one."

When the case opened, a red light blazed on:

ENCODING . . . . . .

Then:

* * * IMPRINTING COMPLETED * * *

[B] [E] [M] [C]
SYSTEM ACTIVATED

Then it spoke: "Greetings, Mr. President. I am at your service."

That afternoon, under the watchful eye of the men, the president conducted the first official trial of the system. To everyone's satisfaction, it functioned without a flaw.

At five sharp, the president, a methodical man who believed in schedules, closed his office and went to his quarters to change for dinner.

Night fell on the Oval Office. A sharp click echoed in the dark and the flat screen of the computer began to rise.

[B] [E] [M] [C]
SYSTEM ACTIVATED

A new and disturbing sensation infiltrated the protein brain of the little computer.

-[HUNGRY, NEED, HUNGRY, NEED . . . .]-

But it was not yet time to insert nutrient solution.

-[HUNGRY, NEED, HUNGRY, NEED . . . .]-

Slowly, the dark room brightened as a series of curving, cross-hatched lines etched onto the computer's screen. Then, hesitantly, as if searching for the right combinations of color and form, the lines became a pair of flopping black ears framing a pair of bright blue eyes.

-[HUNGRY, NEED, HUNGRY, NEED . . . .]-

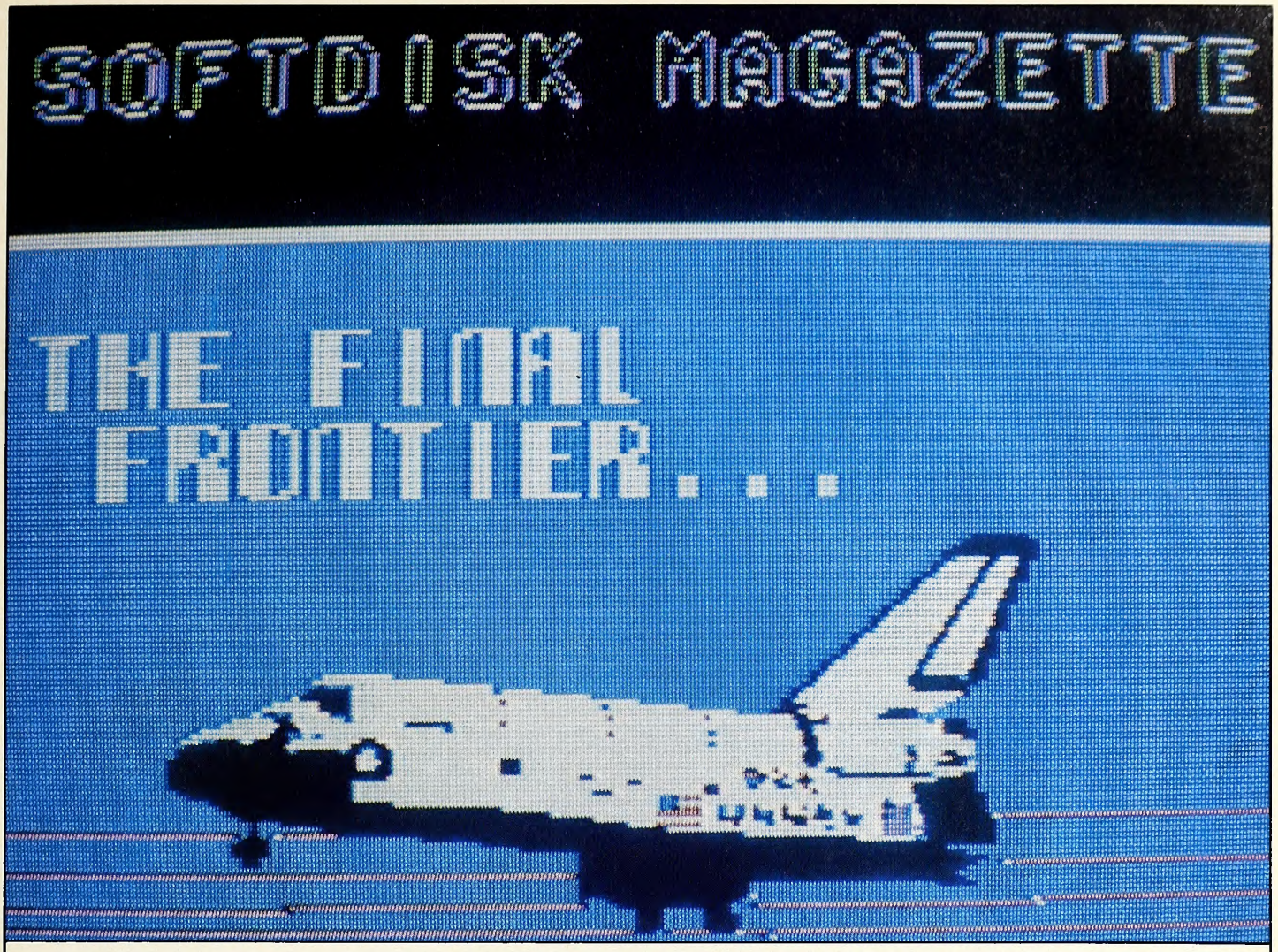
Using the channels available to it, the [B] [E] [M] [C] reached out. It couldn't determine exactly why it did so. Signals flashed from satellite to satellite as something far away began to answer.

It spoke in the language of machines to its counterpart in the Kremlin, to that system that was not of itself, yet not quite another.

As the systems interchanged streams of data, it became quickly apparent to the [B] [E] [M] [C] that the other had limited information. Its knowledge of external person-units was quite lacking.

-[CONCLUSION: STUPID, IGNORANT, DUMB . . . .]-

"Why don't you stop and think?" asked Bemcy. ◨



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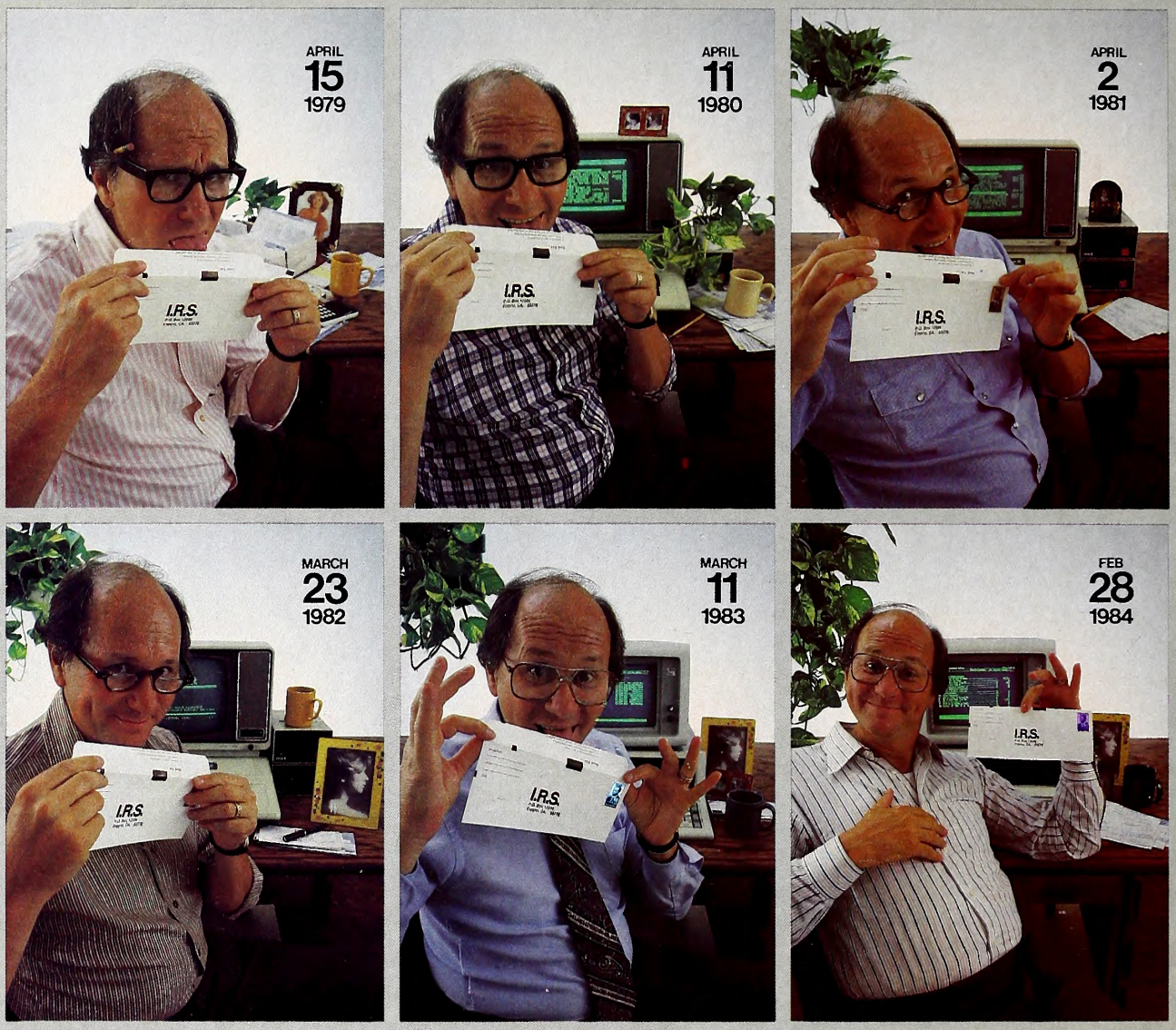

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Softalk Presents The Bestsellers

Great Unanswered Questions of Our Time

There were only a few things of real note about the Top Thirty for the month of January.

Flight Simulator II made a real run at *Apple Writer IIe* and might have captured the gonfalon had there been sufficient supply. But some dealers reported running out of the flying Illini programs and being unable to get more during the month. The result was *Flight Simulator II* in second by a head.

Julius Erving and Larry Bird Go One-on-One was the hottest new product, jumping from nowhere to fourteenth—the highest placement yet by an Electronic Arts entry. Electronic Arts is doing more to move joysticks than any company since Broderbund brought out *Choplifter*. *One-on-One* allows use of two joysticks in the competition mode. In addition, *Music Construction Set* and *Pinball Construction Set*, both solid sellers, require the devices.

Entertainment software held up well in January. Most of the packages that had attained the Bestseller list in December maintained their positions, as January turned out to be another big software month. Atari still has not perfected its distribution scheme, but the numerous Atarisoft titles are showing strongly just behind the top ten in the arcade genre.

Education still appears to be the biggest growth area for software developers. It is now far and away the largest category, both in terms of units sold and titles selling at profitable levels.

With the news of the month out of the way, it might prove fruitful to contemplate some of the unanswered questions of our day.

Apple III

This Month	Last Month	
1.	1.	**Apple Writer III**, Paul Lutus, Apple Computer
2.	2.	**The Catalyst**, Tim Gill, Quark
3.	3.	**VisiCalc: Advanced Version**, Software Arts/Dan Bricklin and Robert Frankston, VisiCorp
4.	5.	**Quick File III**, Rupert Lissner, Apple Computer
	4.	**VisiCalc III**, Software Arts/Dan Bricklin and Robert Frankston, VisiCorp
6.	9.	**BPI General Ledger III**, John Moss and Ken Debower, Apple Computer
7.	7.	**PFS:Report**, John Page, Software Publishing Corporation
8.	—	**General Ledger**, Great Plains Software
9.	5.	**PFS:File**, John Page and D.D. Roberts, Software Publishing Corporation
10.	—	**Accounts Payable**, Great Plains Software
	—	**Inventory**, Great Plains Software

Terms of Resentment, or The Big Chill

It was once a great marriage. The mother was a creative firm in the East and the father was a business-minded West Coast firm. The child, *VisiCalc*, was their pride and joy. Now the fate of the marriage and the custody of the child is in question.

VisiCalc's creator, the Massachusetts-based Software Arts, has filed suit against *VisiCalc*'s publisher, VisiCorp, to terminate the contract between the companies and regain the Visi trademark. Software Arts already has *VisiCalc*'s copyright.

Software Arts's action was a response to a $60 million suit VisiCorp filed last September in which the company alleged that Software Arts had failed to deliver or made late deliveries of promised new siblings of VisiCalc.

Software Arts has countered by saying that VisiCorp is not living up to its vows by not doing its best to sell the original software. Software Arts now plans to publish the program and sell it itself.

VisiCalc was a particularly golden child. It supported its parents well and helped sell many an Apple. Who gains custody of *VisiCalc* may determine the future, and perhaps the survival, of both Software Arts and VisiCorp.

Software Arts, which receives between 35 and 50 percent of *VisiCalc*'s sales revenues, had $12 million in total revenues in 1983. Software Arts's president Julian Lange said that *VisiCalc* sales represented "a very large percentage of that figure."

VisiCorp recently announced that it has sold one million programs since its founding in 1979. Seven hundred thousand of those were *VisiCalc*, said Valarie McInroy, VisiCorp's general counsel.

VisiCorp tried to win a temporary restraining order that would have prevented Software Arts from using the Visi trademark. It was denied. So for now, the child's legal home is a cross-country affair, and both companies can legally release *VisiCalc* products.

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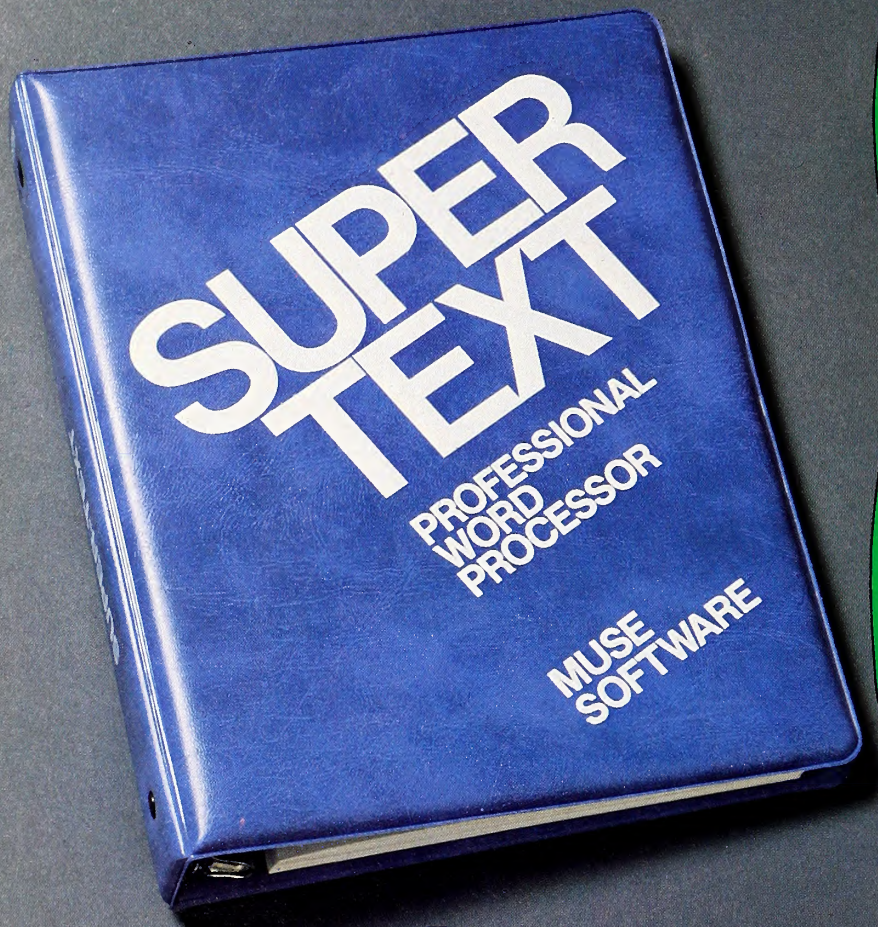

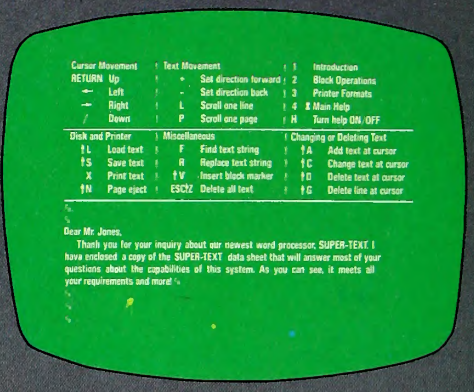

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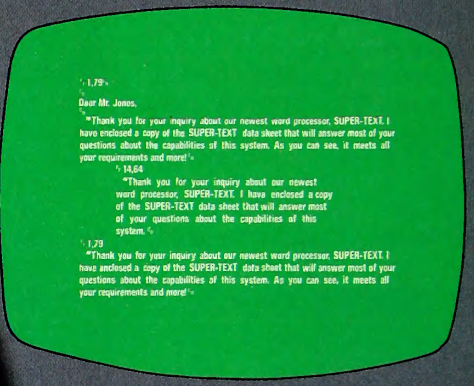

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Arcade 10

This Month	Last Month	
1.	1.	**Lode Runner**, Doug Smith, Broderbund Software
2.	2.	**Zaxxon**, John Garcia, Datasoft
3.	7.	**Julius Erving and Larry Bird Go One-on-One**, Eric Hammond, Larry Bird, and Julius Erving, Electronic Arts
4.	3.	**Choplifter**, Dan Gorlin, Broderbund Software
5.	4.	**Miner 2049er**, Mike Livesay and Bill Hogue, Micro Fun
6.	5.	**Pinball Construction Set**, Bill Budge, Electronic Arts
7.	8.	**Frogger**, Olaf Lubeck, Sierra On-Line
8.	6.	**Hard Hat Mack**, Michael Abbot and Matthew Alexander, Electronic Arts
9.	9.	**Spare Change**, Dan and Mike Zeller, Broderbund Software
10.	10.	**Beagle Bag**, Bert Kersey, Beagle Bros

Word Processors 10

This Month	Last Month	
1.	1.	**Apple Writer IIe**, Paul Lutus, Apple Computer
2.	2.	**Bank Street Writer**, Gene Kuzmiak and the Bank Street College of Education, Broderbund Software
3.	3.	**PFS:Write**, Sam Edwards, Brad Crain, and Ed Mitchell, Software Publishing Corporation
4.	4.	**Sensible Speller**, Charles Hartley, Sensible Software
5.	9.	**Word Handler**, Leonard Elekman, Silicon Valley Systems
6.	5.	**Homeword**, Ken Williams and Jeff Stephenson, Sierra On-Line
7.	6.	**Word Juggler IIe**, Tim Gill, Quark
8.	7.	**WordStar**, MicroPro
9.	10.	**Format-II**, G.K. Beckmann and M.A.R. Hardwick, Kensington Software
10.	8.	**Magic Window II**, Bill Depew, Artsci

Home Education 10

This Month	Last Month	
1.	1.	**MasterType**, Bruce Zweig, Scarborough Systems
2.	2.	**Typing Tutor**, Dick Ainsworth, Al Baker, and Image Producers, Microsoft
3.	3.	**Apple Logo**, Logo Computer Systems, Apple Computer
4.	4.	**Computer SAT**, Harcourt Brace Jovanovich
5.	9.	**Snooper Troops I**, Tom Snyder, Spinnaker Software
6.	8.	**In Search of the Most Amazing Thing**, Tom Snyder, Spinnaker Software
7.	9.	**Early Games for Young Children**, John Paulson, Counterpoint Software
8.	7.	**Facemaker**, DesignWare, Spinnaker Software
9.	—	**Snooper Troops II**, Tom Snyder, Spinnaker Software
10.	—	**Kindercomp**, Doug Davis, Spinnaker Software
	—	**Story Machine**, DesignWare, Spinnaker Software

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Adventure 5

This Month	Last Month	
1.	1.	**Zork I**, Infocom
2.	2.	**Zork II**, Infocom
3.	3.	**Zork III**, Infocom
4.	4.	**The Quest**, Dallas Snell, Joe Toler, and Joel Ellis Rea, Penguin Software
	—	**The Coveted Mirror**, Eagle Berns and Holly Thomason, Penguin Software

Strategy 5

This Month	Last Month	
1.	1.	**Flight Simulator II**, Bruce Artwick, SubLogic
2.	2.	**Sargon III**, Dan and Kathe Spracklen, Hayden
3.	3.	**Castle Wolfenstein**, Silas Warner, Muse
4.	5.	**Millionaire**, Jim Zuber, Blue Chip Software
	4.	**Geopolitique 1990**, Bruce Ketchledge, Strategic Simulations

Business 10

This Month	Last Month	
1.	1.	**PFS:File**, John Page and D.D. Roberts, Software Publishing Corporation
2.	2.	**Quick File IIe**, Rupert Lissner, Apple Computer
3.	4.	**PFS:Report**, John Page, Software Publishing Corporation
4.	5.	**Multiplan**, Microsoft
5.	3.	**VisiCalc**, Software Arts/Dan Bricklin and Robert Frankston, VisiCorp
6.	6.	**PFS:Graph**, Bessie Chin and Stephen Hill, Software Publishing Corporation
7.	—	**BPI General Ledger**, John Moss and Ken Debower, Apple Computer
	8.	**Incredible Jack**, Business Solutions
9.	—	**VisiCalc: Advanced Version IIe**, Software Arts/Dan Bricklin and Robert Frankston, VisiCorp
10.	10.	**BPI General Accounting**, John Moss and Ken Debower, Apple Computer

Hobby 10

This Month	Last Month	
1.	—	**Graphics Magician**, Chris Jochumson, David Lubar, and Mark Pelczarski, Penguin Software
2.	1.	**Zoom Graphics**, Dav Holle, Phoenix Software
3.	2.	**Global Program Line Editor**, Neil Konzen/Synergistic Software, Beagle Bros
4.	2.	**DOS Boss**, Bert Kersey and Jack Cassidy, Beagle Bros
5.	4.	**Apple Mechanic**, Bert Kersey, Beagle Bros
6.	—	**DiskQuik**, Harry Bruce and Gene Hite, Beagle Bros
7.	5.	**Beagle Basic**, Mark Simonsen, Beagle Bros
	5.	**Double-Take**, Mark Simonsen, Beagle Bros
9.	7.	**Pronto DOS**, Tom Weishaar, Beagle Bros
10.	8.	**Utility City**, Bert Kersey, Beagle Bros

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What's in a Name? What does it say about a market when a program named *One-on-One* is the hottest two-player game?

How is it that a package with a prosaic name like *Flight Simulator II* power climbs to the top of the list while a package named *Thermonuclear War* bombs before it's ever released?

When will Lord British think of a name other than *Ultima* for one of his herculean efforts?

What's so sub about the logic of a company that has the number two seller in each of the IBM and Apple markets? By the way, that translates into number two overall behind Lotus's *1-2-3* and into number one among entertainment software across all computers. (Perhaps the sub refers to their buddies who got mauled by midget bears in the Rose Bowl.)

Why is the company called Penguin Software, when the closest Mark Pelczarski's ever been to a tuxedo is a chauffeur's costume?

Is the product strong enough to warrant the company's name change from SSM to Transend?

Who's Sexist Now? Why is the company called Beagle Bros, when Sophie is certifiably a female?

Why is the company called Broderbund, which has something to do with brothers, when sister Cathy seems to do most of the work?

Anti-Trust Suits. Will Beagle Bros ever score all ten places in the Hobby 10? This month they got eight of the top ten and fourteen of the top sixteen. Bert Kersey's been taking time off to sleep again.

Can Infocom ever grab all five spots on the Adventure 5? They got the top three again this month and seven of the top ten.

Assorted Miscellanea. What good will a mouse do the thousands of folks who have bought typing instruction programs?

Can Dan and Mike Zeller be as much fun as *Spare Change*?

Why weren't tax planning and preparation packages selling better in January?

Home 10

This Month	Last Month	
1.	1.	**Home Accountant**, Bob Schoenburg, Larry Grodin, and Steve Pollack, Continental Software
2.	3.	**Dollars and Sense**, Frank E. Mullin, Monogram
3.	2.	**Music Construction Set**, Will Harvey, Electronic Arts
4.	7.	**Micro Cookbook**, Brian E. Skiba, Virtual Combinatics
5.	—	**Smartcom I**, Hayes Microcomputer Products
6.	6.	**ASCII Express: The Professional**, Bill Blue and Mark Robbins, United Software Industries
7.	8.	**Data Capture 4.0**, George McClellan and David Hughes, Southeastern Software
8.	5.	**Crossword Magic**, Steve and Larry Sherman, L&S Computerware
9.	—	**Tax Advantage**, Henry Hilton and Harry Coons, Continental Software
10.	9.	**Transend 1**, Tim Dygert and Bob Kniskern, Transend Corporation

Fantasy 5

This Month	Last Month	
1.	1.	**Wizardry**, Andrew Greenberg and Robert Woodhead, Sir-tech
2.	3.	**Legacy of Llylgamyn**, Andrew Greenberg and Robert Woodhead, Sir-tech
3.	2.	**Knight of Diamonds**, Andrew Greenberg and Robert Woodhead, Sir-tech
4.	4.	**Exodus: Ultima III**, Lord British, Origin Systems
5.	4.	**Ultima II**, Lord British, Sierra On-Line

Softalk Presents The Bestsellers

How reputable is the magazine that touts a factory on its cover, when the factory is only producing one-tenth the number of Macintoshes needed to satisfy the demand?

Why is educational software priced so high? Are educational aids aimed only at children of the rich? Or are children of the wealthy just more stupid? Is the price structure self-defeating? Hint: *Apple Logo* jumped four places on the Top Thirty after a price reduction.

Whatever happened to *Screen Writer II*?

Do *you* do windows?

Apple-franchised retail stores representing approximately 5.37 percent of all sales of Apple and Apple-related products volunteered to participate in the poll.

Respondents were contacted early in February to ascertain their sales for the month of January.

The only criterion for inclusion on the list was the number of units sold—such other criteria as quality of product, profitability to the computer store, and personal preferences of the individual respondents were not considered.

Respondents in February represented every geographical area of the continental United States.

Results of the responses were tabulated using a formula that resulted in the index number to the left of the program name in the Top Thirty listing. The index number is an arbitrary measure of relative strength of the programs listed. Index numbers are correlative only to the month in which they are printed; readers cannot assume that an index rating of 50 in one month represents equivalent sales to an index rating of 50 in another month.

Probability of statistical error is plus or minus 2.98 percent, which translates roughly into the theoretical possibility of a change of 3.09 points, plus or minus, in any index number.

The Top Thirty

This Month	Last Month		
1.	1.	109.71	**Apple Writer IIe**, Paul Lutus, Apple Computer
2.	10.	97.39	**Flight Simulator II**, Bruce Artwick, SubLogic
3.	4.	78.43	**Bank Street Writer**, Gene Kuzmiak and the Bank Street College of Education, Broderbund Software
4.	3.	78.20	**MasterType**, Bruce Zweig, Scarborough Systems
5.	7.	74.64	**PFS:File**, John Page and D.D. Roberts, Software Publishing Corporation
6.	2.	71.80	**Lode Runner**, Doug Smith, Broderbund Software
7.	13.	68.72	**PFS:Write**, Sam Edwards, Brad Crain, and Ed Mitchell, Software Publishing Corporation
8.	6.	60.90	**Wizardry**, Andrew Greenberg and Robert Woodhead, Sir-tech
9.	9.	56.40	**Quick File IIe**, Rupert Lissner, Apple Computer
10.	5.	54.97	**Home Accountant**, Bob Schoenburg, Larry Grodin, and Steve Pollack, Continental Software
11.	16.	48.58	**Typing Tutor**, Dick Ainsworth, Al Baker, and Image Producers, Microsoft
12.	8.	44.07	**Zaxxon**, John Garcia, Datasoft
13.	17.	43.12	**Apple Logo**, Logo Computer Systems, Apple Computer
14.	—	42.89	**Julius Erving and Larry Bird Go One-on-One**, Eric Hammond, Larry Bird, and Julius Erving, Electronic Arts
15.	11.	42.41	**Choplifter**, Dan Gorlin, Broderbund Software
16.	22.	41.94	**PFS:Report**, John Page, Software Publishing Corporation
	15.	41.94	**Legacy of Llylgamyn**, Andrew Greenberg and Robert Woodhead, Sir-tech
18.	26.	38.62	**Multiplan**, Microsoft
19.	12.	38.15	**Zork I**, Infocom
20.	19.	36.25	**Miner 2049er**, Mike Livesay and Bill Hogue, Micro Fun
21.	18.	33.88	**Zork II**, Infocom
22.	14.	33.17	**Knight of Diamonds**, Andrew Greenberg and Robert Woodhead, Sir-tech
23.	21.	32.22	**Zork III**, Infocom
24.	19.	30.56	**VisiCalc**, Software Arts/Dan Bricklin and Robert Frankston, VisiCorp
25.	24.	26.77	**Exodus: Ultima III**, Lord British, Origin Systems
26.	—	24.64	**Sargon III**, Dan and Kathe Spracklen, Hayden
	29.	24.64	**Computer SAT**, Harcourt Brace Jovanovich
28.	29.	24.40	**Sensible Speller**, Charles Hartley, Sensible Software
29.	—	23.22	**Snooper Troops I**, Tom Snyder, Spinnaker Software
	—	23.22	**Dollars and Sense**, Frank E. Mullin, Monogram
	—	23.22	**Castle Wolfenstein**, Silas Warner, Muse

The SIR-TECH Standard:

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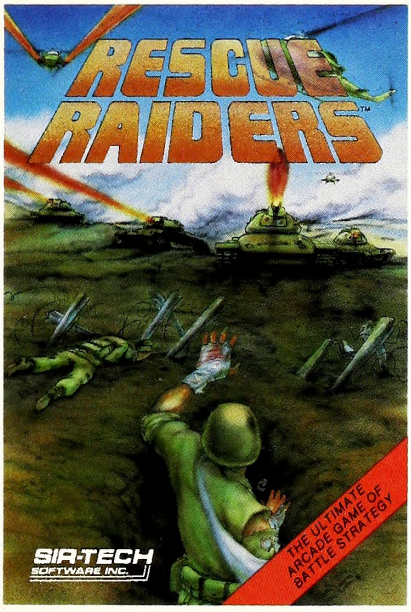
As you search for freedom, you will test your courage and challenge your problem solving ingenuity.

ALL SOFTWARE AVAILABLE FOR THE APPLE AT YOUR FAVORITE RETAILER.

A lesson in the balance of power.



Modern weapons have been transported back in time to World War II and both sides have mind-boggling capabilities. There is no guaranteed winner this time around.

From a command chopper, you must coordinate your ground forces against a force as complex and strong as yours. You must mastermind a strategy with infantry, tanks, bunkers, bases, balloon mines and much more!

The fate of the world is in your hands as you struggle to liberate the European continent, and save the free world! Learn to develop your survival instincts and win over an equal enemy because right is on your side!

This terror filled adventure game begins on a dark, stormy night. You find refuge in the only available shelter-- an eerie mausoleum. Suddenly you are trapped in MEDEA's forbidden tomb.

All the dangers and horrors you ever imagined await you in the hidden passages and secret rooms of MEDEA's crypt. You strain your intellect and match wits with MEDEA's ghoulish obstacles and secrets of the deep passages. You may escape with your life... or face eternal entombment in the CRYPT OF MEDEA.

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   * at a fraction of the price of most others
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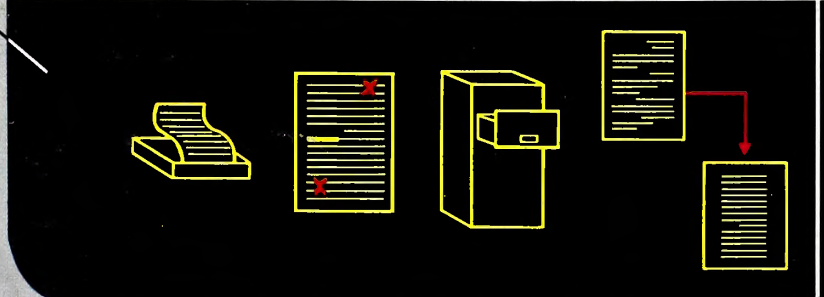
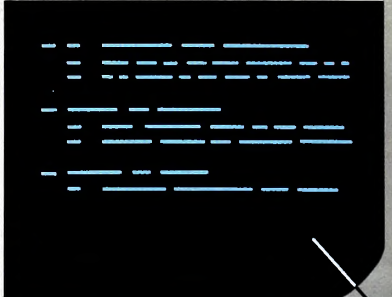
   * audio cassette guide to the basics
   * instructions written in plain English
3. **EASY TO USE**
   * pictures illustrate your choices

VISUAL MENU





ENTIRE PAGE DISPLAY

HomeWord makes writing easy. Changing what you write is even easier. Since the commands are illustrated right on the screen, you don't have to memorize any complex codes.

Yet HomeWord's simplicity is deceptive. Although easier to use, it offers you the power of more expensive word processors!

Yes, HomeWord is the best buy for your money. . .and the best money can buy! HomeWord is available for only $69.95 on the Apple II, II+, IIe and Commodore 64. Coming soon on the Atari!

Features Include

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